

# **Understanding the Ageing Consumer: Exploring Strategies for Overcoming Innovation Resistance**

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# Abstract

This thesis deals with the trend of an ageing population in Germany and the opportunities and challenges that it presents for the consumer goods industry. The goal of the research is to provide a more nuanced understanding of ageing consumers and to suggest strategies to overcome innovation resistance. It departs from the traditional product-oriented research perspective and explores domestic practices of everyday life. Using this approach, it investigates the role of household appliances in facilitating the wish of older adults to age-in-place. Due to the interdisciplinary nature of the research, a synthetic framework was created that melds and extends distinct conceptual elements from separate theories. While previous studies have largely failed to provide a detailed description of user segments, this research applies a novel market segmentation approach that assists in developing more effective innovation strategies. It has extended the Use Diffusion model (Shih & Venkatesh, 2004) by creating a number of novel sub-determinants which direct household technology use in different directions. It posits that different user segments exhibit different levels of interest in future technology acquisition. Based on an advanced understanding of use patterns, the research intends to clarify a possible application of disruptive innovations, which suggest simpler, more familiar and affordable products and services. The research followed a sequential approach to data generation. It begins with interviews conducted during home visits using the task of 'doing the laundry' as a focal practice, interviews with care workers, and medical practitioners. It is supplemented with focus groups comprised of the intended product users in order to generate innovation ideas. A final focus group of industry experts followed and centred on the operationalization of those ideas within an established company. Finally, the thesis developed a synthetic model to support innovation management that is not present in current conceptions.

## Key words

Ageing-in-place, applied ethnography, disruptive innovation, everyday technologies, practices, older adults, sharing concepts.

## **Student declaration**

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas. Any views expressed in the thesis are those of the author and in no way represent those of the University.

Date \_\_\_\_\_ Signed \_\_\_\_\_

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# Abbreviations

AAL.....	Ambient Assisted Living
ADL.....	Activities of Daily Living
ADOPT .....	Accelerating Diffusion of Proven Technologies
BoP.....	Base-of-the-Pyramid
CASP .....	Critical Appraisal Skills Programme
CREATE .....	The Centre for Research and Education on Ageing and Technology Enhancement
DOI .....	Diffusion of Innovation
ECO .....	Emerging Customer Orientation
EP .....	Expert Participant
FG.....	Focus Group
FP .....	Focus Group Participant
IADL.....	Instrumental Activities of Daily Living
ICT .....	Information and Communication Technology
IP .....	Interview Participant
MCO .....	Mainstream Customer Orientation
NPD .....	New Product Development
P .....	Participant
PEOU.....	Perceived Ease of Use
PSS.....	Product Service Systems
PU.....	Perceived Usefulness
UD.....	Use Diffusion
UN.....	United Nations
UTAT .....	Unified Theory of Acceptance and Use of Technology
R&D .....	Research and Development
RO .....	Research Objectives
RQ .....	Research Question
SOC .....	Selection, Optimisation, and Compensation
STS.....	Science and Technology Studies
TAM .....	Technology Acceptance Model
TSE.....	Technological Self-Efficacy
WP .....	Workshop Participant
ZET .....	Zero-effort Technologies

“Things should be made as simple as possible, but not simpler.”  
(attributed to Albert Einstein)

# 1 Introduction

In this chapter the phenomenon of demographic change is investigated along with the potential challenges and opportunities for companies in the consumer goods industry.

## 1.1 Background

Everyday technologies can be part of the way older adults “pursue, maintain and negotiate life” (Loe, 2015, p. 141). In the past decade, household appliances have rapidly evolved from having simple functions to having multifunctional systems. Today’s household appliances often require learning new programmes or operating new kinds of interfaces (Venkatesh, 2008). New coffeemakers frequently interrupt with alarm functions to start the self-cleaning function or to refill the water tank (Venkatesh, 2008). For all of the benefits that technology can provide, it can be cognitively demanding because “complex appliances having a high degree of functionality may require users to navigate complex hierarchies of displays using a few controls” (Higgins & Glasgow, 2012, p. 338). In many respects, the ability to use complex appliances requires a change in behaviour.

As appliances are improved over their life span and more functions are integrated, they ‘overshoot’ the demands of many consumers (Anthony, Johnson, Sinfield, & Altman, 2008; Christensen, 1997, 2013; Christensen & Raynor, 2003; Christensen, Grossmann, & Hwang, 2009) who are reluctant to overtechnologize (Venkatesh, 2008) their homes. In contrast, frustration arising from trying to install and use a new household appliance is a common phenomenon. It appears, that caution must be given to the implications of adding more functions to household appliances (Venkatesh, 2008). It is becoming increasingly obvious that technology and continually improved, more complex products cannot serve as the only means to facilitate independent living. This was the author’s starting point for becoming more deeply involved in the topic of disruptive innovation. Technologies have often been developed based on an insufficient understanding of the diversity of the older customer

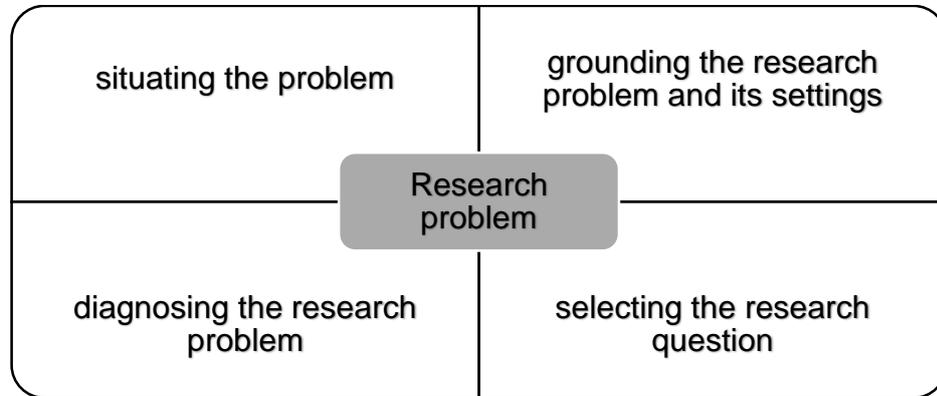
segment. The author claims that a thorough understanding requires shifting the attention from the individual and an “overly excessive orientation to user needs” (Peine & Neven, 2011, p. 129) to the domestic practices that consist of both doings and sayings (Schatzki, Cetina, & Savigny, 2001; Warde, 2005), emphasizing the role and importance of habits (Bourdieu, 1990) and structures (Giddens, 1984) in which they are embedded. In this thesis, it is argued that to realize the potential benefits of disruptive innovation that support independent living; older adults’ habits, structures, and conventions in which daily activities are embedded need to be comprehensively understood.

### **1.2 Purpose of the research study**

This is not the first study applying the disruptive innovation framework to an ageing customer segment (Kohlbacher & Hang, 2011; Kohlbacher & Herstatt, 2011; Kohlbacher, Herstatt, & Levsen, 2014). Why is this research needed? As it stands today, “new product development for older adults is still in its infancy” (Herstatt, Kohlbacher, & Bauer, 2011, p. 12). It is rather surprising that there is only limited research on how companies and entrepreneurs recognize opportunities in the ageing segment (Kohlbacher et al., 2014; Levsen & Herstatt, 2014). This thesis claims that an orientation based solely on company perspective and/or a technology-push orientation will be ineffective because those points of view do not consider the diversity of living realities, habits, and conventions. This thesis intends to provide a more nuanced understanding of the diversity of this ageing customer segment and from there explore opportunities for disruptive innovation. Identifying ways to apply the concept of disruptive innovation to the segment of the older adults, as proposed by many scholars (Herstatt et al., 2011; Kohlbacher & Herstatt, 2011; Kohlbacher et al., 2014), was initially experienced as vague and imprecise. Van de Ven’s (2007) approach of engaged scholarship was used to tackle this hurdle. This approach suggests seeking more interaction with stakeholders and active engagement with the environment (van de Ven, 2007):

“Engaged scholarship is a participative form of research for obtaining different perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) in producing knowledge about complex problems” (p. 265).

This approach seems to be especially helpful when researching an unfamiliar market segment. As a starting point, a robust problem formulation was considered as essential and can be translated into four interrelated activities (van de Ven, 2007).



**Figure 1: Research diamond (van de Ven, 2007)**

For the purpose of this research, those activities of problem formulation were both an iterative and a self-reflective process based on a literature review, conversations with managers, designers, older adults, staff from care organizations, and informed people that the author met at conferences and workshops. These four activities cannot be seen as isolated and independent. The initial framework as derived from the literature review was validated and expanded after a deeper engagement in the research. Occasionally, the first person, 'I' is used "especially where there is reference to personal thoughts and feelings during the research process" (Lee, 2009, p. 169).

## 1.2.1 Situating the research problem

The United Nations (World Population Ageing 2013) underlined the importance of the ageing phenomenon and the opportunities and challenges it entails by highlighting five major findings on world population (United Nations, 2013, p. xii):

- Firstly, population ageing is "taking place in nearly all countries all over the world"
- Secondly, from 2013 to 2050 "the number of older persons (aged 60 and above) is expected to more than double"
- Thirdly, "population ageing has major social and economic consequences"

- Fourth, older persons “can increasingly live independently (with or without their spouse)”
- And lastly, “most developed countries already have an aged population”

In the literature, it is mentioned that globally 40 percent of older persons live independently (United Nations, 2013) and that there is a common understanding that older adults want to live in their homes independently, for as long as possible (Gaßner & Conrad, 2010; Köcher & Bruttel, 2013; Malanowski, Özcivelek, & Cabrera, 2008; Mollenkopf, Kloé, Olbermann, & Klumpp, 2010). As stated in Dörner’s (2007) seminal work *Leben und sterben wo ich hingehöre* (To live and die, where I belong), to him all resources need to be bundled to achieve this target because there are no alternatives available. To Mollenkopf et al. (2010):

It is common sense that older people want to stay in their houses or flats as long as possible. The advantages of knowing how to organise everyday life, as well as the emotional bonds, convey certainty and a feeling of safety. (p. 21)

This common sense approach that ‘older-people-want-to-live-at-home’ has become a normative, dominating discourse (Neven, 2014; Peine et al., 2015), which leaves very little room for discussion in academia about alternative forms of living. For the author, this is an unjustifiable lacuna because it narrows the scope for potential interventions. The Generali Altersstudie 2013 (Köcher & Bruttel, 2013), a large scale survey conducted on those individuals aged 65 to 85 years in Germany, emphasized that “the society is regarding demographics older but regarding mentality and behaviour in many aspects younger” (p. 47). Also the findings show that the current dominant negative age stereotypes, which are based on a deficit model of ageing (Kruse et al., 2012), are out-dated and require a new, more positive ‘age picture.’ These findings confirm previous works (Joyce & Loe, 2010; Loe, 2015; Peine, Faulkner, Jaeger, & Moors, 2015) that question the existing stereotypes of older adults as passive recipients of technology or as being reluctant to accept new technologies. As a consequence, this thesis differs from others because, as a first step, the perception of independent living needs to be scrutinized from different perspectives as a prerequisite for product development.

The first element in formulating a research problem is to identify whose point of view should be represented (van de Ven, 2007) because “the greatest potential source of confusion regarding the language of innovation appears to be that of perspective” (Linton, 2009, p. 730). With regard to that statement, the primary addressees of this research are older adults who wish to stay in their homes for as long as possible. It is reasonable to assume that to continue a normal life, those individuals must be capable of doing everyday domestic tasks that include domestic practices like cooking, dishwashing, and doing the laundry. As such, it needs to be clarified which strategies to market products and services seem to be more effective to address the requirements of the elderly customer segment. Christensen (1997) presented a theory that divides two general classes of technologies: ‘sustaining’ and ‘disruptive’ technologies. He stated that: “What all sustaining technologies have in common is that they improve the performance of established products, along the dimensions of performance that mainstream customers in major markets have historically valued” (Christensen, 1997; p. xvii). In contrast, “disruptive technologies underperform established products in mainstream markets. But they have other features that a few fringe (and generally new) customers value. Products based on disruptive technologies are typically cheaper, simpler, smaller, and frequently more convenient to use” (Christensen, 1997, p. xvii). While most new technology fosters product improvement (Christensen, 1997), disruptive technologies are not “pushing for perfection” (Anthony, Eyring, & Gibson, 2006, p. 8). In other words, disruptive technologies are contradictory to the traditional product improvement view and underline that simpler, more affordable solutions should be considered as well. Several authors address underserved market needs with products that are more convenient to access, easier to use, and cheaper (Anthony et al., 2008; Christensen 1997; 2013; Raynor & Christensen, 2011). While sustaining technologies target demanding, high-end customers (Christensen & Raynor, 2003), disruptive technologies consider ‘low-end’ consumers that are satisfied with ‘good-enough’ performance (Schmidt & Druehl, 2008).

In more recent publications (Christensen & Raynor, 2003; Christensen et al., 2009), the term disruptive technologies was replaced by disruptive innovation in order to extend the scope of disruptive technologies and to include service, technological, product, process, and business model innovations. Markides

(2006) emphasized that technological innovations are fundamentally different from business model innovations, and proposed “finer categories” (p.24) within disruptive innovation. “Because the term disruptive can be so easily misconstrued” (Schmidt & Druehl, 2008, p. 348), the author follows the newer terminology of disruptive innovation (Christensen & Raynor, 2003; Christensen et al., 2009), which includes service and business model aspects (see Table 1). It underlines that “a disruptive innovation is not a breakthrough improvement” (Christensen et al., 2009, p. 5) and that “good-enough can be great” (Anthony et al., 2006, p. 8) for certain customer segments. However, to define new products and services, it is necessary to achieve a better understanding and a “diligent clarification” (Herstatt et al., 2011, p. 10) of which segments are most appropriate for sustaining or disruptive innovations. Yu and Hang (2010) suggested that it remains unknown whether there is a systematic way to identify new disruptive opportunities for applying existing technology or products. In the literature, the theory of disruptive innovations is typically discussed from a company’s point of view or from a technological perspective (Anthony et al., 2008; Christensen, 1997, 2013; Christensen et al., 2009; Raynor & Christensen, 2011). To date, the qualitative research evidence has relied heavily on case-based research using expert interviews (Herstatt et al., 2011; Kohlbacher & Hang, 2011; Kohlbacher et al., 2014), which has led to limited consumer insight about the acceptance of disruptive innovations. As it appears, the micro-level perspective of consumers is not prevalent and is a main point of criticism by scholars (Adner, 2002; Danneels, 2004; Selhofer, Arnold, Lassning, & Evangelista, 2012). In this research, the author takes a different perspective and explores areas for disruptive innovations on the “job to be done” (Anthony, 2008, p. 55) level. To Christensen and Raynor (2003), this approach “can help managers segment their markets to mirror the way their customers experience life” (p.74). This aspect is similar to exploring the ecosystems of things (Shove, Watson, Hand, & Ingram, 2007), rather than technology in isolation. Table 1 provides the working definition of the constructed used in this research.

**Table 1: Definition of disruptive innovation used in this study**

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Disruptive  
innovations

Disruptive innovation describes "the process by which complicated, expensive products and services are transformed into simple, affordable ones" (Christensen et al., 2009, p. 3).

The new product or service assists customers to achieve "more effectively and conveniently what they're already trying to do" (Christensen & Raynor, 2003, p. 93).

Marketing research should explore "the job, and *not* the customer or the product" (Christensen et al., 2009, p. 11).

The business model must earn money at lower market prices and at sales volumes that initially are low (Christensen & Raynor, 2003).

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The research hopes to contribute to the performance of companies within a competitive market. It should help companies engaged in global competition to understand the value of disruptive innovation for emerging markets.

Policymakers could be the third segment with interest in this research because in Germany, care policies pursue the aim to enable older adults in need of care to live at home as long as possible (Mollenkopf et al., 2010). In this thinking, technology is regarded as the key strategy for enabling independent living. Additionally, this research could benefit a fellow DBA researcher with an interest in causalities, who could use this explorative study as a starting point for a quantitative study. The next question to consider is: Who and what belongs in the foreground and background in focusing on the problem? The older person living in his home is in the foreground; the relatives are in the background. The motives underlying the desire of older individuals to age-in-place are very similar across the reviewed empirical studies. There is a pervasive, rather uncritical, view (Czaja et al., 2006; Demiris et al., 2004; Mitzner et al., 2010; Mollenkopf et al., 2010) that home has a central place in the lives of people as it represents security and freedom.

### 1.2.2 Grounding the research problem

This section should help to ground the research problem in practical experience. As a first step, the traditional journalist's questions have to be addressed regarding who, what, where, when, why, and how does the problem exist (van de Ven, 2007). From the author's professional experience, it became clear that the living realities, habits, and routines of older adults (who) are often neglected or not sufficiently included into the product development process (what) of a company (where) because they are not regarded as a target group and are not considered competent enough to talk about new or future technologies (why).

Obviously, there is a dilemma to be faced: As household appliances are improved over their life span and are integrated with more functions, they often 'overshoot' the demands of consumers (Raynor & Christensen, 2011). Additionally, this phenomenon makes usability a major concern. Scholars (Coughlin, D'Ambrosio, Reimer, & Pratt, 2007) underlined that "concerning ageing, we are talking too much about technology and not about innovation" (p. 54), which relates to major questions about how to assess and capture the innovation potential of this segment and which innovation strategy is the most appropriate. While many scholars from various disciplines agree that the ageing population is a highly diversified segment (Joyce & Loe, 2010; Kohlbacher et al., 2014; Mitzner et al., 2010), it is safe to say that this is not acknowledged sufficiently in many empirical studies. For any product development to neglect the diversity is an unjustifiable shortcoming. A "diligent clarification" (Herstatt et al., 2011, p. 10) of the target group is required because to the United Nations (2013) the older population is itself ageing. "Globally, the share of older persons aged 80 years or over ("the oldest old") within the older population was 14 percent in 2013 and is projected to reach 19 percent in 2050" (p. xiii). The United Nations term older adults aged 80 years and over as the oldest old. Today, in the field of gerontechnology, the differentiation of third age (approx. 60 to 80/85 years) and fourth age (approx. from 80/85 years) is established as a general orientation for research and practice (Kruse et al., 2012). As Erikson (1998) mentioned old age in the 80s and 90s is accompanied with daily difficulties, new demands and revaluation of priorities. However, besides the diversity among and within the categories, there seems to be a pervasive view

that the so-called 'baby boomers,' aged 55 to 65, are very different from the previous generation (Pak & Kambil, 2006; Peine et al., 2015; Niemelä-Nyrhinen, 2007; Wolfe & Snyder, 2003). The baby boomers are the first cohort that has been exposed to digital technology and been "enculturated into consumer lifestyles" (Peine et al., 2015, p. 2). It seems, then, that the equivocal findings within the ageing segment in relation to technology use can be put down to cohort effects and unclear market segmentation.

### **1.2.3 Diagnosing the research problem**

As a first step in diagnosing the problem, the elements or the symptoms of the problem should be categorized (van de Ven, 2007). Ageing-in-place describes the concept of the older people continuing to reside in the family home. It represents the dominant single generational housing situation in later life. The importance of ageing-in-place is related to "societal recognition of the role of ownership and attachment to place, and to the presumed need for the familiar, as adaptive features of ageing" (Rowles & Ravidal, 2002, p. 90).

As this thesis is part of the ageing and innovation discourse, it is important to reconsider the innovation and technology strategies and the intended outcome. There still exists a dearth of research that explores older individuals and their experience with accomplishing everyday tasks (Loe, 2015; Shove et al., 2007; Sixsmith & Gutman, 2013). The author explores the possible contribution and limitations that different disruptive innovation strategies can offer to facilitate daily housework activities. The purpose is also to broaden the concept of disruptive innovation.

A number of influential studies have examined various personal, technical, and social determinants that have an influence on older adults technology use (Chen & Chan, 2011; Czaja et al., 2006; Heinz et al., 2013; Mitzner et al., 2010) in different fields of application like computers (Czaja et al., 2006), smart technologies (Demiris et al., 2004; Ehrenhard, Kijl, & Nieuwenhuis, 2014) and an emerging field – social robots (Neven, 2014). These studies provided a foundation for this study. However, most studies relied heavily on 'gathering user needs.' A different perspective is offered by the capability approach that puts emphasis on what the individual can do with technology in relation to their

well-being rather than on the technology itself (Coeckelbergh, 2012; Nussbaum, 2003; Nussbaum, 2011; Steen, Aarts, Broekman, & Prins, 2011). As a matter of fact, the influence of habits, conventions and power relations which are underpinning daily routines are typically neglected in research.

### **1.2.4 Selecting the research questions**

Having carried out the first three steps of the problem formulation process (van de Ven, 2007), the final step was the selection of the research questions. It appears that research “at the intersection of entrepreneurship, innovation management, and demographic change is still in its infancy” (Kohlbacher et al., 2014, p. 10). One key driver for selecting the research questions is the assumption that the elderly want to stay independent for as long as possible: “living independently tends to be a sign of economic self-sufficiency and higher standards of living” (United Nations, 2013, p. 38). Therefore, it is important to understand how independent living is perceived by the elderly and under which conditions they would prefer staying in their homes. The ability to organize everyday life (Mollenkopf et al., 2010) requires using everyday technologies such as domestic appliances (Higgins & Glasgow, 2012; Jakobs, Lehnen, & Ziefle, 2008; Loe, 2015). With this in mind, the study explores the first research question:

#### **How are independent living and the influence of household technology perceived by the elderly?**

If the answer to the first question leads to the conclusion that independent living is significant for the well being of elderly individuals and can be regarded as a social need, then an exploration of the context of independent living is required. Loe (2015, p. 5) suggested that “mundane everyday devices are important playing fields of active ageing.” This thesis aims to understand the extent to which everyday technologies, like household appliances, can facilitate domestic practices, thus independent living. To be able to carry out domestic chores, like doing the laundry, offers continuity over the course of a day and a life. According to scholars from sociology (Shove et al., 2012; Warde, 2005), consumer ‘demands’ are created from practices. As an example, not being capable of doing the laundry can have unpleasant effects because doing the

laundry is related to getting dressed. However, depending on others to do the laundry can be perceived as very humiliating. Seemingly, some elderly customers will demand new products and services to get 'jobs' done that they have always done, but are no longer able to perform on their own (Christensen & Raynor, 2003; Kohlbacher & Hang, 2011). If managers, who specify mass-produced household appliances, have an influence in the ways daily tasks in the domestic domain develop (Shove et al., 2007; Shove, Pantzar, & Watson, 2012), then the following research question must be addressed:

### **What are determinants that affect use patterns of household technology?**

It appears that some older adults are not getting the products they want, and companies seem to neglect this market segment (Peine et al., 2015), which relates to product and innovation management. An explanation for this seems to be that older people are seen by product managers and designers in general as "distinct from other, normal users" (Peine & Neven, 2011, p. 132), which shows the lack of a nuanced understanding of different user typologies. In so far, the determinants affecting different technology use patterns need to be better understood because "only those companies that carefully measure trends in how their customers *use* their products can catch the points at which the basis of competition will change in the markets they serve" (Christensen, 1997, p. xxviii). This relates to the approach of Shih and Venkatesh (2004), who suggested that different usage patterns relate to different inclinations in adopting new products. It can be assumed that determinants differ in importance and the role they play on usage patterns. That could be a point of departure for the identification of different use patterns and a sound basis for the assumption that technologies that offer less functional complexity might be relevant to and applicable for certain segments of the population. Segmenting the elderly market based on usage patterns has a twofold goal. First, it provides an orientation about the capabilities and willingness of potential older users to adopt certain features and products. Second, it helps to identify and avoid unnecessary product 'overengineering' and useless features for certain segments of elderly users (Markides, 2006). As a consequence, if useless product specifications are identified and omitted, then household appliances become more affordable (Markides, 2006). That forges a path for disruptive innovations, which suggests simpler, more convenient, and affordable products

and services (Christensen & Raynor, 2003). If the findings indicate that some older adults are unwilling to integrate new technologies with additional, improved features, and performance in their daily routines, then disruptive innovations could provide a strong value proposition (Daneels, 2003; Markides, 2006). Van de Ven's (2007) emphasis on defining the problem concludes with the evaluation of the consequences. The approach is to identify starting points for a viable business model for developing and commercialising disruptive innovations, which could provide a guideline for strategic management (R&D, design, product marketing). Finally, the last question should evaluate how disruptive innovations targeted at older adults should be commercialised:

**What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?**

The author will make use of the Pentathlon framework by Goffin and Mitchell (2010) as a guideline for this research question as it allows splitting the field into more understandable and manageable parts. This framework enables clearer discussions of the potential configurations of business elements and implications for an established organization to adopt a disruptive innovation strategy.

### 1.3 Chapter summary

To sum up, the overall aim of this study is to contribute knowledge and managerial implications for companies exploring the potentials of the emerging segment of elderly customers. The author builds on and contributes to work in disruptive innovation theory (Adner, 2002; Anthony et al., 2008; Christensen, 1997, 2013; Christensen & Raynor, 2003; Markides, 2006; Raynor & Christensen, 2011; Schmidt & Drühl, 2008) as applied to the emerging ageing consumer segment (Herstatt et al., 2011; Kohlbacher & Hang, 2011; Kohlbacher et al., 2014), thus contributing to theory and practice. An updated version of the “expansion table” (adopted from Bernecker, 2015) is used at the end of every chapter to show the expansion of content of this thesis.

**Table 2: Expansion table**

Research Questions	Research Objectives	Sources
How to identify and manage entrepreneurial opportunities for an ageing consumer goods market?	The research study on hand is to contribute knowledge and managerial implications for companies in the consumer goods segment by exploring the opportunities of the emerging segment of elderly customers.	Overall research study
(1) How are independent living and the influence of household technology perceived by the elderly?	(1) To understand the perception and the meaning of independent living and ageing-in-place by the elderly and the role household technology might play.	Secondary data and primary qualitative data
(2) What are determinants that affect use patterns of household technology?	(2) To gather and validate determinants affecting use of household technology. To identify usage patterns as a basis for market segmentation and product innovation.	Secondary data and primary qualitative data
(3) What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?	(3) To suggest an entrepreneurial approach serving current mainstream customers and new (potential) elderly customers embedded in a new business model framework	Secondary data and primary qualitative data

### **1.4 Structure of the thesis**

The remaining part of the thesis is organized as follows: In chapter 2, the author gives a review of the body of knowledge related to the research questions. Key empirical works regarding innovation and user studies with or about older adults are presented. This part includes a discussion of the key research themes and findings. To achieve this goal, a systematic literature research approach was applied. As a next step, due to the interdisciplinary nature of the research, the literature review provides a critical presentation of related theories, concepts, and frameworks from different disciplines. The chapter closes with an initial research framework that melds and extends distinct conceptual elements from separate theories. This synthetic framework guides the following research steps. Chapter 3 presents the research methodology; the research process and the methods are described in relation to the research questions. In chapter 4, the findings of the different data collection stages are presented in a sequential manner. It begins with home visits to elderly people to observe them conducting domestic tasks and the commonly associated difficulties with performing those tasks ('what is'). The second part presents findings from focus group discussions of possible solutions and future concepts ('what ought to be') and looks at the product development aspect. This chapter discusses the views of multiple stakeholders in technology and alternative means. The chapter builds the basis to identify business implications and closes with the final conceptual framework. The key insights and conclusions of the thesis are presented in chapter 5 and future research directions are also discussed.

## 2 Literature review

### 2.1 Systematic literature review and narrative literature review

A literature review is about defining a review protocol and mapping the field by accessing, retrieving, and judging the quality and relevance of studies in the research area (Easterby-Smith, Thorpe, & Jackson, 2008; Hart, 1998; Tranfield, Denyer, & Smart, 2003). In accordance with Tranfield et al. (2003, p. 209), “systematic reviews differ from traditional narrative reviews by adopting a replicable, scientific and transparent process ... that aims to minimise bias.” As starting point to construct the conceptual framework, a systematic literature review was performed by focussing “on those studies and theories that are particularly relevant” (Maxwell, 2013, p. 40) for the research. Fink (2009) divided the systematic literature review into seven tasks, which were applied by the author as a guideline to carry out the review: (1) selecting research questions, (2) selecting bibliographic or article databases, (3) choosing search terms, (4) applying practical searching criteria, (5) applying methodological screening criteria, (6) doing the review, and (7) synthesizing the results.

The first step of defining the research questions was carried out in the introductory chapter. In the following course of the thesis, the application of Fink’s approach leads to an initial conceptual framework. The structured process and systematic approach aim at ensuring the objectivity of the research process (Fink, 2009). However, the systematic literature review process and related methodology have limitations based on their reductionist manner and narrow focus (Tranfield et al., 2003). As it appears, the degree of success in locating relevant concepts and ideas through a systematic literature review is limited, “The most productive conceptual frameworks are often those that bring in ideas from *outside* the traditionally defined field” (Maxwell, 2013, p. 40).

Because the topic requires interdisciplinary research fields, it was necessary to expand the search and carry out a narrative literature review. Thus, the following literature review is divided into two parts. The first part consists of a

systematic literature review based on empirical studies about technology acceptance related to older adults. The second part broadens the field and gathers background information from various disciplines in the form of a narrative review.

### **2.2 Systematic literature review**

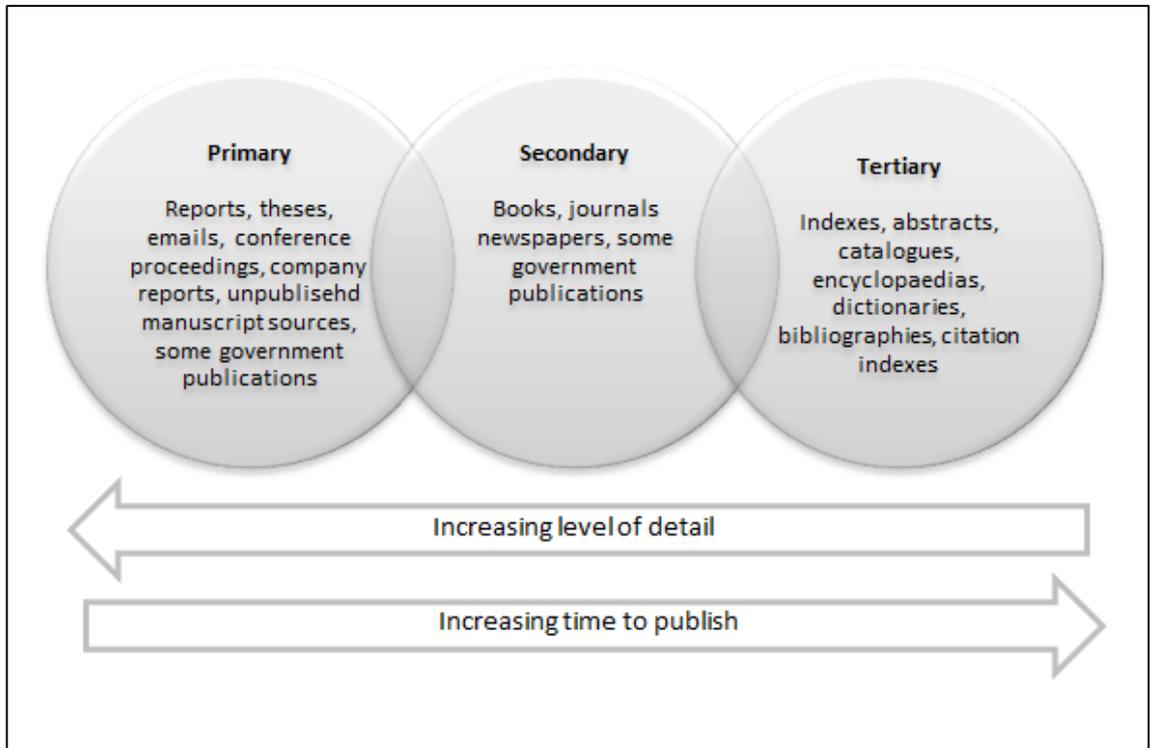
As early as 1985, Drucker mentioned demographic change as one of the seven sources of innovative opportunity. The systematic literature review incorporates academic works as well as key works of practitioners and provides an overview of research fields related to technology that address the growing segment of older adults and their wish to live independently in their homes.

#### **2.2.1 Search strategy**

Saunders, Lewis, & Thornhill (2007) distinguished three categories of literature resources: primary, secondary, and tertiary sources, which commonly overlap. The authors stated that when information flows from primary to secondary to tertiary sources in this process; it frequently becomes less detailed and authoritative, but more easily accessible. Because primary literature sources can be difficult to trace, those sources are sometimes referred to as grey literature. According to Saunders et al. (2007), the use of literature sources will depend on the research questions and objectives, the need for secondary data to answer them, and the time available. For some research projects, only tertiary and secondary literature might be useful; for others there is a need to locate primary literature as well.

The figure below is based on an illustration by Saunders et al. (2007) and provides an overview of the literature sources used. As initiatives of assistive technologies for the elderly population have gained momentum in recent years, particularly initiated by policymakers, it was the author's intention that the literature review should reflect current thinking as closely as possible, which necessitated including primary sources. However, the author recognizes the need to be aware of the limitations of such sources. Secondary sources utilize information already published in primary sources and require time to publish;

the information in these sources can be dated (Saunders et al., 2007). While some research is based solely on secondary sources, this author will also use primary sources in order to acquire the most recent trends about the quickly evolving aspects of ageing-in-place and the related areas of technology and innovation development.



**Figure 2: Literature sources (Saunders et al., 2007, p. 64)**

According to Maxwell (2013), current knowledge can not be found in the library, but “in unpublished papers, dissertations in progress .... and in the head of researchers working in the field” (Maxwell, 2013, p. 40). Throughout the study, the author took part in various conferences and workshops as a strategic element of the systematic literature review. Those events often provided a starting point for a deeper engagement in secondary sources. For the author, those sources have been important throughout the study because they were current and frequently provided more detail than journal articles.

### **2.2.2 Resources used for literature research**

The first step in the research was to identify a number of important reference works in the realm of technology studies that addressed ageing. A choice had to

be made where to put the threshold for the core literature, which will be discussed in this section.

For the review, different search strategies were used to search and locate different relevant articles, reports, and literature. In order to identify the relevant publications in the field of ageing and technology the author conducted a systematic web search. The following major databases provide a broad coverage of journals (Saunders et al., 2007):

- Emerald Insight
- Science Direct
- EBSCO Host (Business Source Complete)
- Google Scholar

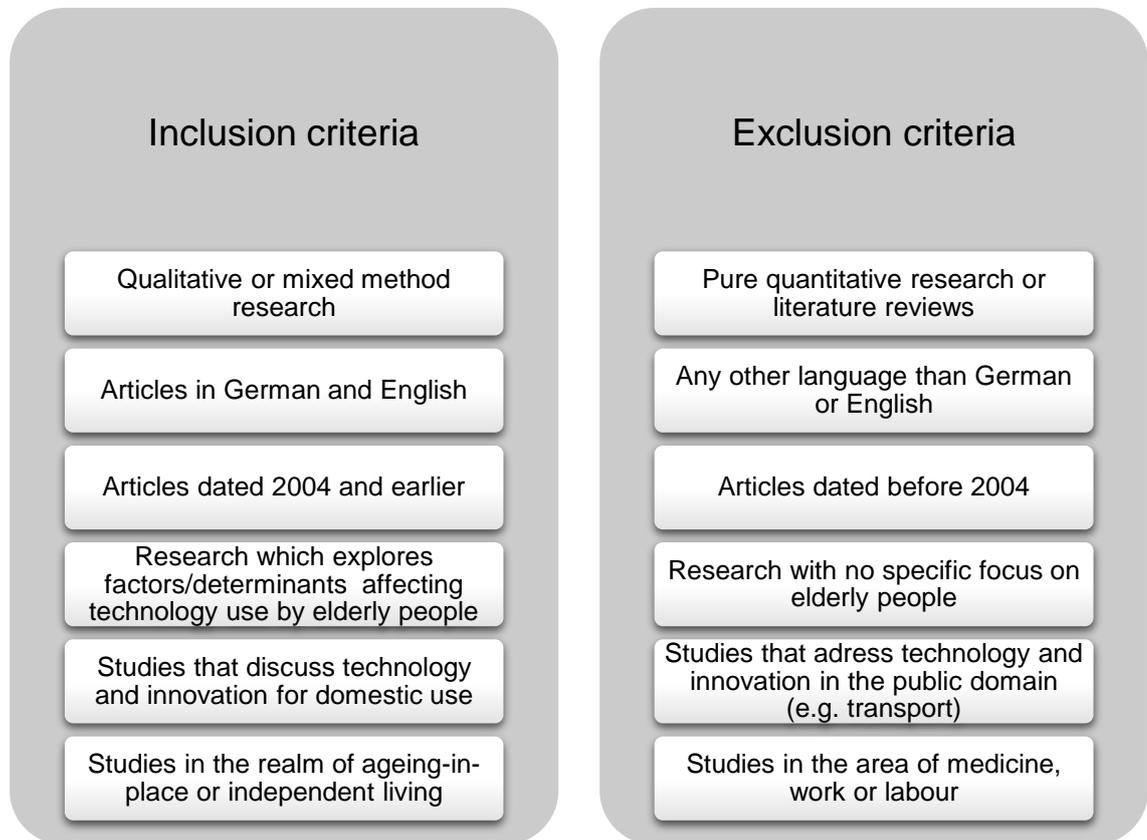
In the initial stage the systematic literature review generated a rather diffuse mix of articles from various disciplines and themes. The rather ill-defined broad categories of technology studies and ageing are published predominately in the relatively new and emerging field of gerontology and geriatrics medicine, which underlines the interdisciplinary nature of this research. However, when studying innovation, the initial results from the literature review also underscored the need to define clearer boundaries for the research and to exclude peripheral papers and those within a completely different context and intended for a different purpose.

To avoid a stigmatization of elderly users as being ill and frail, papers have been excluded that deal with assistive technology in relation to age-related diseases like dementia. The category demographic change provides a first macro-level overview of the economic consequences of an ageing society. However, for a better understanding at micro-level, particularly about the technology acceptance of elderly, that search term proved unsuitable.

In retrospect, the search was not a single event on a specific day, but was performed throughout the whole study. It can be described as “a continuous process, requiring writing and refocusing throughout the research process” (Easterby-Smith et al., 2008, p. 52), which ended with the final draft of this thesis (August 2015).

### 2.2.3 Article selection

Subsequently, titles, abstracts, and full articles were reviewed applying the inclusion and exclusion criteria mentioned in figure below. In addition, references from the included articles were checked for other articles.



**Figure 3: Inclusion and exclusion criteria**

The different research approaches were acknowledged by searching for typical terms of a philosophical approach in the title or in the abstract of the article or report (Peek et al., 2014). The word explore or qualitative indicates that the reviewed article is based on qualitative research (Easterby-Smith et al., 2008; Maxwell, 2013). Words like testing or quantitative indicate that the article is based on a quantitative approach and was excluded from the review process (Easterby-Smith et al., 2008; Maxwell, 2013). The aim was to identify articles with a similar interpretive level similar to the study on hand, which has an explorative character. Therefore, for the systematic literature review, pure quantitative research was excluded. However, quantitative research was considered for the narrative literature review. Due to the fast progress of new smart technologies in the domestic domain, the time frame for sources was

limited to those published in 2004 and afterward. Research papers published prior to that date could not be accepted for the systematic review because the author assumed that the perception of older people towards new technology is quickly evolving. Older articles and sources could make drawing a relevant comparison nearly impossible. Additionally, the sources must address older adults as related to technology use in the private domain. As the author wanted to identify support in the daily activities of older people, only papers related to the domestic domain were selected. This is also the reason why papers were excluded that focussed on research related to older people in the context of long term care institutions. Finally, the paper had to be written in English or German due to the language limitations of the author.

### **2.2.4 Data collection and analysis**

A consultation of the citation lists of some key articles (Christensen & Raynor, 2003; Kohlbacher & Herstatt, 2011; Peek et al., 2014; Rogers & Fisk, 2010) confirmed that the research topic is a blend of different disciplines and various subthemes. Therefore, the definition of proper search terms was not sequential, but was rather an iterative process.

In order to establish a better way of tracing the process of finding successful terms, the search terms were revised in a step-by-step manner. In the next step, after the research questions matured more, the search terms from the research questions were included. To have an internal logic on how to apply the key phrases, the terms were placed into categories (based on the journalists questions provided by van de Ven, 2007) to allow their combination. The search terms were generated through a key word analysis based on the key literature in the field.

**Table 3: Overview of key terms**

Key term 1 (Who?)	Key term 2 (Where?)	Key term 3 (Which?)	Key term 4 (Why?)	Key term 5 (How?)
<ul style="list-style-type: none"> <li>• Elderly</li> <li>• Aged</li> <li>• Older</li> <li>• Ageing</li> <li>• Senior</li> <li>• Baby boomers</li> <li>• Demographic change</li> </ul>	<ul style="list-style-type: none"> <li>• Place</li> <li>• Home</li> <li>• Ageing-in-place</li> </ul>	<ul style="list-style-type: none"> <li>• Smart technology</li> <li>• Assistive technology</li> <li>• Disruptive technology</li> <li>• Sustaining technology</li> <li>• Smart home</li> <li>• AAL</li> <li>• ICT</li> <li>• Household electrical appliances</li> </ul>	<ul style="list-style-type: none"> <li>• Quality of life</li> <li>• Independent living</li> <li>• Autonomy</li> <li>• Safety</li> <li>• Capabilities</li> <li>• Mobility</li> <li>• Domestic practices</li> <li>• (Instrumental) Activities of daily living</li> </ul>	<ul style="list-style-type: none"> <li>• Adoption</li> <li>• Perception</li> <li>• Use</li> <li>• Diffusion</li> </ul>

Databases were searched using a combination of five groups of key words: (1) search terms that address the target audience: older, senior, elderly, and synonyms for those terms; (2) search terms that relate a specific technology to the field of application included place, home, ageing-in-place, and the like; (3) search terms that relate to a specific technology like assistive technology and similar search terms, (4) search terms that relate to the intended outcome like independent living and (5) search terms leading to the relationship of a person towards a technology like adoption.

Based on an initial exploratory search with the broad meta-search engine Google Scholar, some applicable articles were selected. Emerald, Science Direct, and EBSCO were identified as valuable complementary academic data sources and used for the further systematic literature review. At the start, the following combination of more general search terms were linked using “Boolean logic” (Saunders et al., 2007, p. 77) to get a first overview of the research scope:

- “Elderl\*” AND “technology” AND “ageing-in-place” resulted in over 8.000 hits. The asterisk was also used to include words like “elderly user.”
- A comprehensive, yet more focussed search allowed for the selection of approximately 200 hits using the terms: “technology” AND “ageing-in-place” AND “independent living” AND “senior” OR “older adults” OR “ageing” OR “older people” AND “qualitative research.”

The abstracts of those 200 articles were assessed for eligibility of topic relevance and were further classified and grouped according to the inclusion/exclusion criteria. By evaluating the title and abstract further and eliminating duplicate papers, the outcome could be further reduced. In addition, a snowball method (Peek et al., 2014) was used where references of the included articles were checked for other appropriate articles. Thus, bringing the total number of articles included in this review to 31 (see Appendix 3).

A critical review of qualitative studies is difficult because no commonly agreed upon criteria exists for those types of studies (Saunders et al., 2007; Tranfield et al., 2003). In order to limit bias, a checklist related to the structure and content of the paper under review was used (Peek et al., 2014). Three elements need to be considered when appraising the report of qualitative research (CASP, 2014; Peek et al., 2014):

- Rigor: has a thorough and appropriate approach been applied to key research methods in the study?
- Credibility: are the findings well-presented and meaningful?
- Relevance: how useful are the findings to you and your organization?

However, those three elements were deemed as too broad. Therefore, a more detailed checklist with ten questions (see Appendix 2) was applied to help think about these issues systematically and to provide better transparency of the assessment. Qualitative articles were assessed using the critical appraisal skills programme (CASP, 2014). Peek et al. (2014) used this checklist to explore factors that influence the willingness of older adults to use technology for ageing-in-place. The questions cover items such as appropriateness of research design, sampling, data collection, reflexivity, ethical issues, data analysis, a clear statement of findings, and value of the research.

### **2.2.5 Quality of reviewed articles**

Overall, 31 articles and reports were found to meet the inclusion criteria, which was seen as a starting point to “develop a reliable knowledge base” (Tranfield et al., 2003, p. 220). Having identified the core literature on technology and innovation studies, it became apparent that some articles shared the same

overall characteristics and addressed similar themes. For the assessment process, an inductive method was applied. Categories were created and the individual articles falling into the categories were grouped. The table (see Appendix 3), adapted from Peek et al. (2014), provides a simplified descriptive analysis (Tranfield et al., 2003) of the core authors, methods, and determinants. The table also illustrates a thematic analysis (Tranfield et al., 2003) about the commonalities and differences in content of the reviewed articles in a comprehensive format.

### **Commonalities and differences of articles**

Articles about technologies and innovation with similar character regarding the field of application are grouped and sorted into the same category (see Appendix 3). The three categories are comprised of: activities of daily living (ADL), which includes articles about domestic tasks; smart home/ambient assisted living (AAL), which is comprised of articles mainly addressing security in the home. Both ADL and AAL are relevant when it comes to ageing-in-place. The third category is described by the emergent field dealing with research studies about social robots. Researchers typically envisaged the robot as assistant and emotional companion of older adults in their homes. This area will not be taken into consideration any further because the author's concern is domestic practices.

Furthermore, the articles are assigned to the level of market diffusion as it makes a difference if a prototypical and unfamiliar technology (like a social robot) was researched or a well-known existing household technology. Moreover, for a better comparison of research findings across studies it was important to understand the theoretical underpinning of the papers and the disciplinary orientation of the article.

By referring to the CASP criteria, the author will highlight the most important findings and at the end of each criterion will briefly reflect on implications for the current study. The literature review underscores that the phenomenon is rooted in various disciplines.

### **(1) Appropriate research design**

During the search process it became clear that approaches are rather diversified because methods are often adapted for the specific technology under investigation. Technology is seen as a key enabler to support older adults in their wish to age-in-place in the fields of sociology, gerontechnology, innovation and technology studies, consumer research, and health care. Therefore, based on the research design the interpretive level of the studies varies quite a bit.

### **Thematic analysis**

Articles in the field of smart and assistive technologies that promise to enhance safety and support in health were the most prominent types of technology. In technology studies for elders, one can often find a specific set of related statements. These statements include that there is an ageing population (Kohlbacher & Herstatt, 2011; Malanowski et al., 2008; Mitzner et al., 2010; Wolfe & Snyder, 2003) that is a challenge (Peine et al., 2015) or even a dilemma (Mollenkopf et al., 2010) because the costs of aged care are increasing (Coughlin et al., 2007; Kohlbacher et al., 2014; Mollenkopf et al., 2010; Tinker & Lansley, 2005) and at the same time the number of caregivers is decreasing (Mollenkopf et al., 2010).

Older people are seen as “distinct from other, normal users” (Peine & Neven, 2011, p. 132) and “will fight for their independence” (Blythe, Monk, & Doughty, 2005, p. 686). In research studies smart technology is often regarded as a key strategy to overcome this dilemma (Mollenkopf et al., 2010). In most cases the meaning of the term smart or assistive technologies is obscured, leaving unclear whether other alternatives exist. It has been argued that technology enhances life (Demiris et al., 2004; Friedewald, Da Costa, Punie, Alahuhta, & Heinonen, 2005) and provides support with activities in daily life (Loe, 2015; Mitzner et al., 2010). In general, the industries or companies are criticized of not paying enough attention of this market segment (Herstatt et al., 2011; Kohlbacher et al., 2014; Mathur, Lee, & Moschis, 2005; Wolfe & Snyder, 2003). They are generally accused of neglecting the needs of older adults or stereotyping them as ‘frail and weak.’ This perception has been criticized by many scholars with the assertion that older people are “not passive consumers”

(Flandorfer, 2012, p. 6), but use and adopt technological products in a creative way to fit their needs (Joyce & Loe, 2010; Loe, 2015) and thereby “graying the cyborg” (Joyce & Loe, 2010; Joyce & Mamo, 2006). Therefore, this discussion requires a deeper investigation of the determinants affecting adoption of technology in the context of use.

### **Transformation from single devices to smart technology systems**

The literature review revealed that a rapid, dynamic transformation is underway from single, technical devices that support the activities of daily living to smart and assistive technological systems (Venkatesh, Kruse & Shih, 2003). Thus, multifunctional, technological systems are a new focal point of academic research. For example, consumer research studies are beginning to focus on smart home and ambient assisted living (AAL) where different technologies and services are integrated in the homes of the elderly offering monitoring and alarm systems (Balasch et al., 2014; Ehrenhard et al., 2014; Heinz et al., 2013; van Hoof, Kort, Rutten, & Duijnste, 2011). One reason for the dominance of research in this field is the strong (financial) support by policy makers (Balasch et al., 2014; Gaßner & Conrad, 2010; Mollenkopf et al., 2010). In the current landscape of smart technologies, telecare, as an example, is seen as a cost-saving and autonomy-enabling solution (van Hoof et al., 2011) because it can delay or simply replace the psychological and social burden of moving to a care institution and the related economic cost (van Hoof et al., 2011). However, the overreliance on technology should be questioned because to remain at home in later life does not necessarily require the need for new technological devices (Neven, 2014). In recent years, research about existing everyday technologies to support domestic practices such as household appliances (Jakobs et al., 2008; Loe, 2015; Shove et al., 2007) has been done to a lesser extent. More frequently, increased attention has been given to disruptive innovation as applied to the segment of elderly consumers (Kohlbacher & Hang, 2011; Kohlbacher & Herstatt, 2011; Kohlbacher et al., 2014). There has been a breadth of cases examined that explore products like social robots, electric bikes, and mobile phones. All were used to investigate different types of disruption, their targeted performance, and market application including the targeted customers (Kohlbacher & Hang, 2011). It was found that most of the cases are new-market types which result from a “latent demand by un-served

potential customers” (Hang, Garnsey, & Ruan, 2014, p. 3). As an example, electrical bikes were described as low-end and new-market disruptions because they are not as fast and powerful as real motorbikes, but ‘good enough’ to support mobility and to get from one point to another including increased safety and stability (Kohlbacher & Hang, 2011). In another study, Herstatt et al. (2011) explored the relevance and dimension of autonomy by conducting case studies about different companies offering a wide variety of products, such as urogenital implants, cell phones, PC/notebooks and robot suits. They concluded that the main theme of their cases is related to autonomy enhancement of older adults. In a more recent study, Levsen and Herstatt (2014) conducted multiple case studies about “age-based innovations” (p. 8) such as stair lifts, walking frames, outdoor, mobility and assistive social robots, to identify whether lead markets exist, which they found is not the case. Despite the high value of these contributions, the main research focus of this study is on everyday household technologies and context of use. As a matter of fact, the introduction of new appliances that support the elderly in daily activities often challenges the existing arrangement in the home (Heinze, 2013), which makes the home modification even more burdensome and costly (Gomez, 2015). Obviously, not enough studies have highlighted the role of the “physical-spatial-technical environment on ageing” (Wahl, Iwarsson, & Oswald, 2012, p. 1), only a few studies highlighted the relevance of the physical environment on technology use (Gomez, 2015; McCreddie & Tinker, 2005; Rogers & Fisk, 2010). Based on that perspective, it seems necessary to explore the influence of the existing arrangements in the home more deeply, particularly when it comes to domestic household appliances designed to facilitate everyday activities.

In the analysed research studies, the author found little information regarding the socio-economic factors of technology acceptance. Chen and Chan (2011) noted that the factor cost (price) of technology is neglected in many studies, although it seems to be a critical factor in technology acceptance. Blythe et al. (2005) stated that older people are excluded from technology not only by physical disability: “Over 75-years-olds are far more likely to suffer financial hardship than other age groups and may be excluded from technology simply because they cannot afford it” (p. 687). That statement underlines an approach to disruptive technology that emphasizes affordability, not only functional matters. To sum up, in the mainstream discourse ageing is viewed as being a

social and economic burden (Zimmermann, 2013) or dilemma (Mollenkopf et al., 2010). In this thinking, most articles and studies link the desire to age at home with the development of new, more sophisticated, and rather expensive smart technologies (Balasch et al., 2014; Ehrenhard et al., 2014; Neven, 2014; van Hoof et al., 2011), and are mainly based on addressing user needs (Joyce & Loe, 2010; McCreddie & Tinker, 2005; Rogers & Fisk, 2010; Tinker & Lansley, 2005). In recent years, more studies have emerged suggesting that disruptive technology can be seen as an alternative, more realistic solution that departs from the underlying belief of a technology strategy that 'more is better.' However, the overreliance on case-based studies has led to limited insights into the relationship of disruptive innovation and elderly user acceptance, which refers mainly to a methodological gap.

### **Research methods**

Four general distinctive research directions were observed from the literature review. These research directions can be generally distinguished in 'what is' (Steen, 2008), which is a move from the researcher to the world of the participant to understand the current use of technology; and 'what ought to be' (Steen, 2008), which entails a move from the participant into the world of the researcher to explore future product developments.

- One research direction is related to the physical and mental decline of older adults (e.g., van Hoof et al., 2011). Technology is about intervention, e.g., in the form of monitoring systems to compensate for such a decline.
- Second, studies about future concepts take a different direction. The characteristics of technology are presented and evaluated by the older user e.g., by presenting user scenarios in a narrative manner in focus group sessions (Monk, 2008; Neven, 2014; Renaud & van Biljon, 2008).
- Third, ethnographic research attempts (e.g., Jakobs et al., 2008; Loe, 2015) of the everyday life of users provide a more in-depth analysis of older adults' encounters with technology (Peine et al., 2014). Here the goal is not only to understand specific problems in technology use, but also the socio-material context of use (Kelly & Gibbons, 2008; Peine et

al., 2014). Usually, ethnographic research allows for a more diverse and richer view of elderly users and their lived realities.

- Studies about the disruptive innovation application typically rely heavily on case-based research that examines real life products like electric bikes, notebooks or gerontechnologies (Joyce & Loe, 2010; Wahl et al., 2012), which are innovations particularly developed to compensate for age-related declines, like stair lifts or advanced walking frames. Everyday technologies (Loe, 2015) like domestic appliances have not been researched sufficiently. Scholars (Herstatt et al., 2011; Kohlbacher et al., 2014; Steen, 2013) have emphasized the potential social side effects of disruptive innovations in areas of health care (Christensen et al., 2009) and education (Christensen, Horn, & Johnson, 2008) and have collectively urged more research on this topic.

Conducting focus groups is a common method applied to gain an understanding of older people's attitudes about a specific field of technology (Demiris et al., 2004; Heinz et al., 2013; Mitzner et al., 2010). However, those studies do not contextualize technology in daily activities. Because those studies rely on data gathered from a single method, they lack deeper insights about contextual determinants. As they neglect the context of use, the physical burden or the embodiment of consumers (Lai, Dermody, & Hanmer-Lloyd, 2008) is not sufficiently understood, which is particularly important for studying older adults' use of household technologies that are embedded in domestic practices. Furthermore, they lack triangulation because they do not provide information from different perspectives, like relatives or experts. Little research attention was found that explored different user typologies, which addresses the diversity of the elderly segment. This was rather surprising, as it is an important guideline in the design phase, particularly when it comes to applying concepts like disruptive innovation. Ethnographic research via observations and interviews can be seen as an attempt by researchers to understand the current situation (Kelly & Gibbons, 2008; Steen, 2008), which involves a move to the homes of the older user, e.g., to explore areas for age-friendly kitchens (Maguire, Nicolle, Marshall, Sims, & Lawton, 2011; Sims et al., 2012). It seems that researchers with a foundation in sociology (Jakobs et al., 2008; Mitzner et al., 2010) typically talk about the current situation or 'what is' (Steen, 2008). The more consumer

and innovation-oriented researchers (Coughlin et al., 2007; Herstatt et al., 2011; Kohlbacher et al., 2014; Neven, 2010, 2014; Peine et al., 2015) focus more on future user scenarios 'what ought to be.'

In summary, no research was found about disruptive innovation combining an understanding of current technologies with an exploration of future concepts. Usually, there is a clear-cut distinction between these two fields (Steen, 2008). To combine both directions in a single study is seen as a research gap that should be addressed in further research with the aim of better understanding the opportunities and challenges an elderly user has to face when shifting from using existing technology to using new technology.

### **User representation**

To avoid ageism in product development it seems to be crucial to identify the characteristics and stereotypes of how older people are represented and described by researchers (Akrich, 1995; Joyce & Mamo, 2006; Peine, Rollwagen, & Neven, 2014). In fact, technology development and market implementation strategies are influenced by whether a technology is seen as an everyday technology (Jakobs et al., 2008; Loe, 2015) or an aged-based innovation (Levsen & Herstatt, 2014) that compensates age-related deficits. The market for those types of technologies is relatively small; therefore, companies that produce them miss the cost savings that come with consumer mass markets (Blythe et al., 2005).

The concept of user representation is based on Akrich (1995) who defined it as those ideas, images, and stereotypes about prospective users that inform technology and design. The literature review revealed very typical user characteristics and representations of older persons. One way in which researchers and designers represented older persons was in terms of illness or decline (Balasch et al., 2014; Kohlbacher et al., 2014; Tinker & Lansley, 2005; van Hoof et al., 2011) and in "felt need" for technological assistance (McCreadie & Tinker, 2005) to regain or maintain autonomy and to prevent dependency on others (Herstatt et al., 2011; Kohlbacher et al., 2014). In these articles, an older person's physical, cognitive, and mental health was often seen as deteriorating. Certain technologies like age-based innovations (Levsen & Herstatt, 2014) are developed to help older people cope with age-related deficits, their

shortcomings, and vulnerability (Gomez, 2015). By following this argumentation, older persons were stereotyped as dependent and in need of help. Alternative, positive images of older persons as healthy and active, of which many obviously exist, were basically ignored and a lack of discussion existed about their use patterns, life-styles, and technological experiences.

### **Consumer resistance to innovations**

In previous studies the industry has been accused of stigmatizing elderly consumers or neglecting the market potential (Kohlbacher & Hang, 2011; Peine et al., 2015; Peine & Neven, 2011). Mainly due to the fact, that “product designers rarely overtly consider the needs of seniors when designing appliances” (Higgins & Glasgow, 2012, p. 336) and most discussion of appliances and their use is directed at young adults, older people are disregarded (Chen & Chan, 2011). Based on that manner of thought, older adults are identified as being indifferent and resistance to new technologies and are differentiated from ‘normal users.’ If technology and innovation processes are based on user representations similar to those mentioned above, then the resulting technologies may implicitly or explicitly position elderly users as frail, ill, or in need of care (Neven, 2010). There is also a misconception and an overemphasis in the literature on the designer role. As such, the underlying entrepreneurship and epistemology affects the innovation strategy (Alvarez & Barney, 2010) which has implications how products are developed.

However, researchers rarely discussed older people in terms of diversity. The reviewed research studies neglect the complexity and diversity of lived realities. What follows is a rather typical and limited description of user needs throughout all research studies. Peine et al. (2014) recently introduced the concept of “innosumers,” which relates in many aspects to the “lead user” concept identified by von Hippel (2005). This viewpoint provides a more active role of older people when it comes to technology acceptance, particularly when configurational or system work is required that combines material with immaterial knowledge inputs that are necessary to configure technological components with everyday life (Peine et al., 2014). The author sees the rather separate, dichotomous research approaches as a major research gap that must be addressed. When it comes to technology research, there is an overemphasis

on older adults as users with age-related health declines; the customer perspective is a rather neglected and separate research field.

### **Different levels of market maturity**

An important starting point for a comparison of research studies is to understand the market maturity of the technologies studied. This is critical as there is often a misconception that technology is often equated with new (Bailey and Sheehan, 2009). The technologies under review can be broadly categorized into several categories. The first is characterized by studies that address existing technology that supports the activities of daily living (Friedsdorf & Heine, 2007; Jakobs et al., 2008; Maguire et al., 2011). The second strongly emerging field deals with technological systems that are in the pre-implementation phase and typically have a prototypical character. In this area, the literature addresses smart homes and assistive technologies (Balasch et al., 2012; Coughlin et al., 2007; Demiris et al., 2004; Heinz et al., 2013; van Hoof et al., 2011) and most recently, social robots (Neven, 2010; Wu, Fassert, & Rigaud, 2012). Results show that a majority of the articles explore technology in the pre-implementation phase. In these studies, researchers typically use prototypes (Balasch et al., 2014; Neven, 2010) or animations and pictures (Wu et al., 2012) to explain concepts of technology. As a matter of fact, both the level of technological maturity and the market diffusion of the technology vary across the studies, which makes a direct comparison hardly possible. Furthermore, determinants in the pre-implementation phase and post-implementation phase of technologies might differ (Peek et al., 2014).

Future exploration has to take into account more context-specific determinants of technology use in the home of the elderly. Neven (2010) underscored the valuable contributions of ethnographic studies and stated that this research method allows deeper insights into the way older people interact with new technology in their home settings.

### **(2) Sampling strategies**

The sampling strategy of the reviewed articles varied a lot. Mitzner et al. (2010) conducted focus groups involving 113 participants including race and ethnic diversity; on the other hand, Demiris et al. (2004) involved 15 participants. Also, other studies were based on a rather small sampling size (e.g., Coughlin et al.,

2007; Monk, 2008) ignoring the diversity of the ageing segment. Also the sampling criteria regarding socio-demographics showed no homogenous picture. The literature review confirmed that “There appears to be no consensus on the characteristics that define one as an „older person“ (Moschis, Lee, & Mathur, 1997, p.283). In some studies (Friesdorf & Heine, 2007; Jakobs et al., 2008) people aged 55 years and older were recruited and characterized as older adults, an age at which most people are still working. In another study about everyday technologies (Loe, 2015) older adults aged 82 years and older were recruited. To consider cohort effects is “a crucial part of understanding their common social contexts and familiarity with particular technologies” (Loe, 2015, p. 3), making a direct comparison of the studies hardly possible. Although ‘convenience’ sampling was used in all articles, the findings from the literature presented very inconsistent approaches regarding sampling strategies. This is particularly true with consideration to the definition of ‘old age,’ which varied from the age of 55 to 82. That variation made those studies unsuitable for comparison due to cohort effects. Thus, applying meta-ethnography (Noblit & Hare, 1988) was deemed inappropriate.

### **(3) Data collection and analysis**

A lack of credibility was an issue for some studies that relied primarily on self-reported statements by participants (Demiris et al., 2004; Heinz et al., 2013; Mitzner et al., 2010) because direct observations of usage patterns in the natural context were not included (Suchmann, 2007). A neglected data collection method is the observation of the actual use of technology in the home of the elderly. Only two studies focussed on prototypes installed in the homes, which was beneficial because experience and learning might have an impact on technology use and are not taken into account in studies relying on self-reports about unfamiliar and untried technologies (Balasch et al., 2014; van Hoof et al., 2011). Further research would benefit from reducing social distance between researchers and older adults (Lew, Marwede, & Herstatt, 2015). By understanding the contextualization of new concepts, researchers get familiar with the environment in which technology is used by older adults. This is obviously a matter of financial resources and time as well. Data analysis mainly refers to content analysis (Heinz et al., 2013; Levsen & Herstatt, 2014). However, due to its ‘reductionist manner’ (Kuckartz, 2012) complementary

methods will also be considered for this research, which seems to be necessary, as this is the basis for meaning making.

### **(4) Reflexivity and ethics**

For reflexivity, an assessment was made regarding whether researchers critically examined their own role, potential bias, and influence in the process of conducting the study (CASP, 2012). Those criteria were absent in the majority of the reviewed articles. With regard to assessing the researcher's role and potential bias, the underlying research motivation and the stakeholders have to be taken into account. According to van de Ven (2007):

Most studies entail at least three stakeholders: the researcher (s), the intended user or audience, and the sponsor of the research. The interests and the perspective are not always the same. That being the case is crucial for engaged scholars to identify, negotiate and choose whose interests and perspectives are featured in the study. (p. 163)

Much research and numerous articles in the field of 'ambient assisted living' and 'smart homes' are supported by policymakers (e.g., Balasch et al., 2014; Ehrenhard et al., 2014; Mollenkopf et al., 2010), which is not always obvious from the outset. The financial support from policymakers plays an important part in the field of technologies studies related to older adults; this implies that researchers and their publications are less independent than they should be. Another criterion was related to ethical considerations. Little attention was given to make the ethical considerations explicit. The author found this surprising because ethical issues play an important part when researching issues that relate to older adults.

### **(5) Findings and implications of the included articles**

The majority of the reviewed studies do not explicitly build on or contribute to an existing theory. Only 13 out of 31 of the articles reviewed were based on a theoretical approach, which hampers a direct comparison between studies. A similar problem has been found in a systematic literature review conducted by Peek et al. (2014) about factors that influence acceptance of technology for ageing-in-place.

### 2.3 Narrowing down the research phenomenon

Several important conclusions were drawn concerning this literature review. First, there is no clear guidance about the terminology and when old age begins. The author is aware that stereotypes negatively affect user images, which would obviously influence the research process. Neven (2010) suggested that designers and researchers rethink their user representation. Thus, the author follows the guideline of the *Publication Manual of the American Psychological Association* (2012) and the approach of sociologists Joyce and Loe (2010) and uses the term 'old,' 'older adults,' or 'older people' as an attempt to counter social stigma and ageism (Butler, 1969; Kruse, Rentsch, & Zimmermann, 2012). In using the terms listed above, the author tries to reposition ageing individuals as persons with a broad technological background experiencing innovations ranging from the introduction of the TV and washing machine in the 1960s to the personal computer in the 1990s (Sackmann & Weymann, 1994). This framing calls attention to a more active participation of technology integration and use in daily life instead of a 'doddering and feeble' (Joyce & Loe, 2010) representation. Second, there is a methodological gap to be considered. Most articles exploring the application of disruptive innovation to this segment conduct research about the elderly people not with the elderly. This is present in research methods like case studies with expert interviews in the form that the requirements and benefits for the older adults are discussed without the direct involvement of older adults.

Further, the term technology is used very broadly in the literature and is applied to solutions that have existed in the market for many years and is also applied to completely new prototypical devices. For this study, the author refers to technological appliances as defined by van de Goor and Becker (2000): "By this we mean the appliances that relieve the burden of household labour...." (p. 16). Technology adoption is sometimes distinguished from technology acceptance (Jakobs et al., 2008; Peek et al., 2014). However, the two terms are usually interchangeable, which will also be applied to the current study.

In a following step, a meta-ethnographic approach needs to be considered. Meta-ethnography (Noblit & Hare, 1988) is a set of techniques that is similar in many ways to the comparative analysis method for synthesizing qualitative

studies. The overall aim of meta-ethnography is to achieve greater understanding and attain a level of conceptual or theoretical development beyond that which is achieved in any individual empirical study (Noblit & Hare, 1988). However, “in most systematic reviews the heterogeneity of study data prevents the use of meta-analysis” (Tranfield et al., 2003, p. 214). This is also applicable to this study, which makes a direct cross-case comparison of the findings hardly possible. Some publications provide good insight about what is technologically feasible without offering much analytical substance. Second, there are technologies with different levels of market maturity. Thus, as studies do not share the same interpretive level, a meta-ethnographic approach had to be rejected.

### **2.4 Related theories, models, and frameworks**

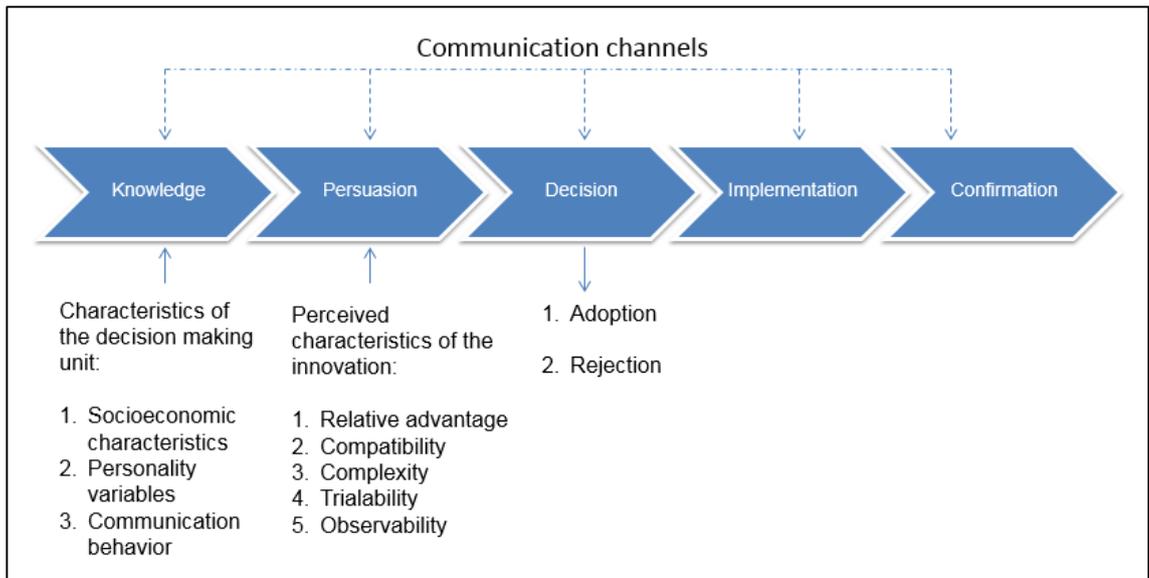
As previously mentioned, the systematic literature review provided a starting point to “develop a reliable knowledge base” (Tranfield et al., 2003, p. 220). It showed that the demographic shift has already spurred the emergence of new areas of technology research such as “aged based-innovations” (Levsen & Herstatt, 2014, p. 18) or gerontechnologies. However, due to the reductionist nature of a systematic literature review, broader explanations and discussions about the theoretical underpinnings were missing. These broader insights are helpful to understand the approach provided in the thesis.

A narrative review supports the identification of what is considered relevant for the topic; however, it does so without a specified methodological plan (Easterby-Smith et al., 2008; Grimby, 2010; Tranfield et al., 2003). Although a narrative literature review “discusses and summarises the literature on a particular topic without conforming to a particular search formula” (Gary, 2009, p. 34), the review followed a certain pattern. The scholarship on which this thesis draws comes from a number of traditions including innovation studies, science and technology studies, gerontechnologies, sociology, and psychology. All of those disciplines have relevant models and concepts that contribute to supporting ageing-in-place. In a following step, in order to capture the complexity of the phenomenon, it is necessary to move through various fields of knowledge production. The author provides a critical presentation of a number

of separate theories as a basis to create a synthetic model that melds and extends distinct conceptual elements from different disciplines. Apart from that, this section contributes to the development of a coherent model that is used as a research model that guides the further research process.

### **2.4.1 Innovation and diffusion of innovation**

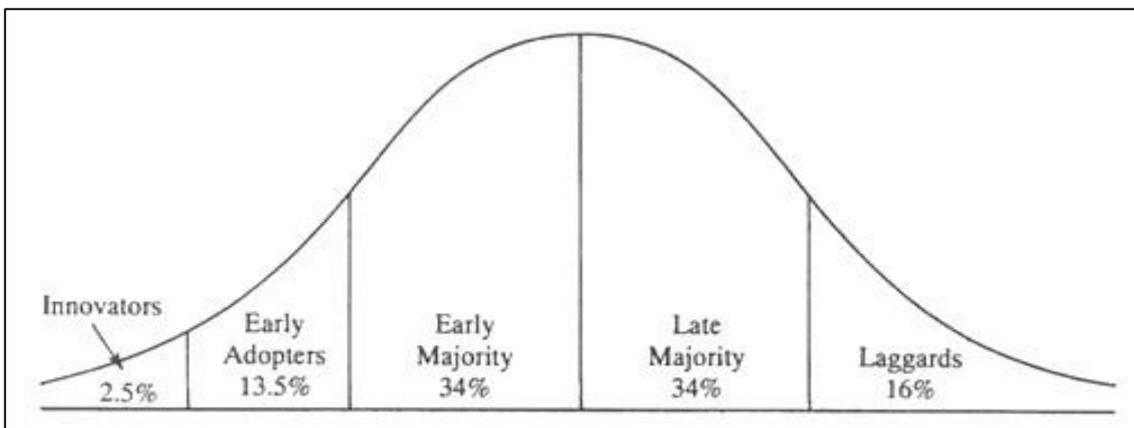
Goffin and Mitchell (2010) mentioned that innovation management is rather complex and multifaceted and results in different entrepreneurial approaches. As such, “there are many kinds of innovation” (Norman and Verganti, 2012, p. 5) and classification may vary. To a large degree, the literature discusses a diffusion-oriented perspective of innovation adoption (Christensen, 1997; Christensen & Raynor, 2003; Moore, 2002; Rogers, 2003; Slater & Mohr, 2006). Rogers (2003) defined an innovation as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (p. 12). In this line of thought, innovation can comprise almost anything from high-tech products to simpler every day devices, as long as it is perceived as new for the adopter (Moore, 2002). Diffusion is defined by sociologist Rogers (2003) as “the process in which an innovation is communicated through certain channels over time among the members of a social system” (2003, p. 5). However, not all members of society adopt at the same time. According to Rogers (2003), the innovation decision process (see figure below) is the process through which an individual passes from the first knowledge of an innovation (1), to persuasion (2), to a decision to adopt or reject (3), to implementation of the product (4), and finally to confirmation of this decision (5).



**Figure 4: The innovation-decision process (adapted from Rogers, 2003)**

The pace of adoption of an innovation depends on five product characteristics. Perceived innovation characteristics are an essential part of Rogers’ (2003) theory and need to be considered for this research. In the original version he defined five key characteristics: relative advantage, compatibility, complexity, observability, and trialability. According to the characteristics of an innovation, Rogers (2003) stressed that the relative advantage is a key driver of customer innovation adoption. The underlying assumption is that all innovations are always perceived as improvements and should be adopted by everyone. Past studies criticized this view for neglecting factors that lead to consumer resistance to adopt innovations (Claudy, Garcia, & O’Driscoll, 2015; Garcia, Bardhi, & Friedrich, 2007; Laukkanen, Sinkkonen, Kivijärvi, & Laukkanen, 2007; Moore, 2002; Ram & Sheth, 1989). “Innovation resistance can be seen as a less applied concept in diffusion research” (Laukkanen et al., 2007, p. 424). That perspective reflects a lacuna in many diffusion studies because “The higher the discontinuity of an innovation, the higher the resistance is likely to be” (Ram & Sheth, 1989, p. 7). As a matter of fact, a high failure rate can be observed across product categories (Claudy et al., 2007; Garcia et al., 2007; Ram & Sheth, 1989). “The most common reason for customer resistance to an innovation is that is not compatible with existing workflows, practices, or habits” (Ram & Sheth, 1989, p. 7) and that it disrupts the current routines. It is frequently the case that a technology-driven approach leads to incremental innovations and a dilemma because “the design of everyday things is in great

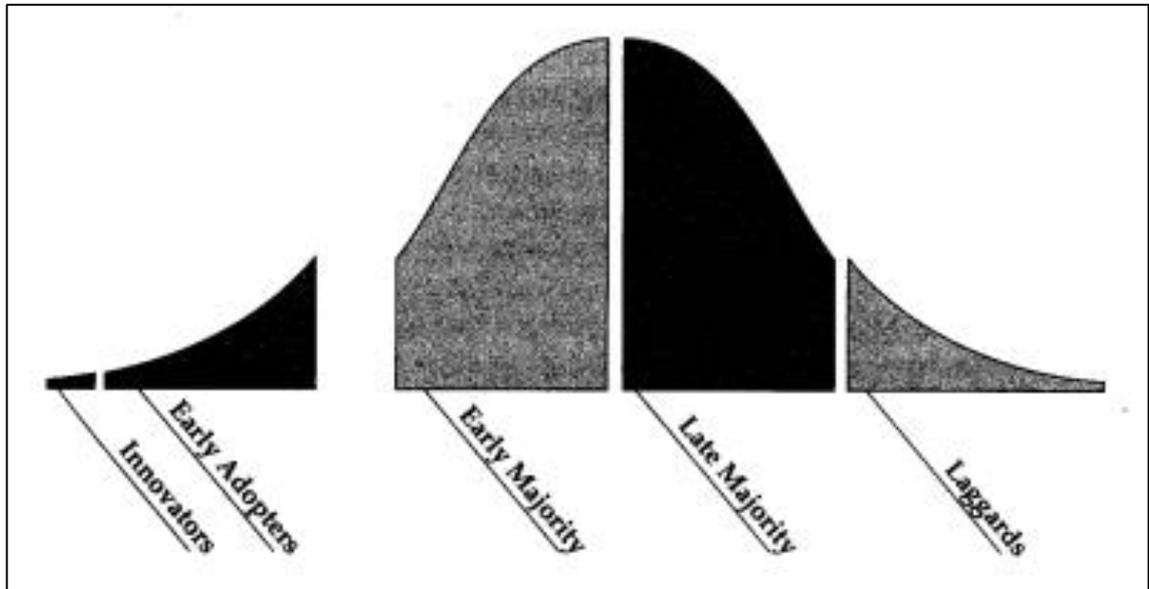
danger of becoming the design of superfluous, overloaded, unnecessary things” (Norman, 2013, p. 293). As such, a “diligent clarification” (Herstatt et al., 2011, p. 10) of the target group is required before an innovation management process should commence. Rogers (2003) made no distinction in age: “Earlier adopters are no different from later adopters in age” (p. 288). However, the systematic literature review revealed that some older adults seem to be more resistant to new technologies because they do not perceive a relative advantage for some new technologies with additional features (Chen & Chan, 2011; Heinz et al., 2013; Iyer & Reisenwitz, 2010; Jakobs et al., 2008; Neven, 2010). Conversely, there are older adults who are proactively using new technology (Joyce & Loe, 2010; Peine et al., 2014). Thus, it would appear that the degree of innovation resistance varies among older adults. The study of innovation diffusion by Rogers (2003) focussed mainly on the stage at which products are penetrated into a specific market segment. The basic premise of the adoption and diffusion process is that there are different categories of adopters. Rogers categorized five different types of adopters (see figure below). These categories of adopters each have unique characteristics and buying needs (Moore, 2002; Rogers, 2003). The bulk of the adopters falls within the early majority and late majority adopter categories (Moore, 2002; Rogers, 2003; Slater & Mohr, 2006).



**Figure 5: Adopter categorization (Rogers, 2003, p. 281)**

This model suggests that the way to penetrate a market is to capture each segment in a consecutive manner (Moore, 2002, Slater & Mohr, 2006). “Successful diffusion implies a smooth progression from one category of adopters to the next, which is necessary for a firm to create leadership in its industry!” (Slater & Mohr, 2006, p. 28). However, Moore’s work, built on research by Rogers, identified the existence of a chasm between early adopters

and an early majority (see Figure 6). “The basic flaw in this model ...is that it implies a smooth and continuous progression over the life of a product” (Moore, 2002, p. 56). Moore (2002) claimed that many high-tech innovations do not even reach the mass markets and argued that a chasm arises because the marketing strategies to reach the early adopters (‘the visionaries’) do not meet the demands of the early majority (‘the pragmatists’).

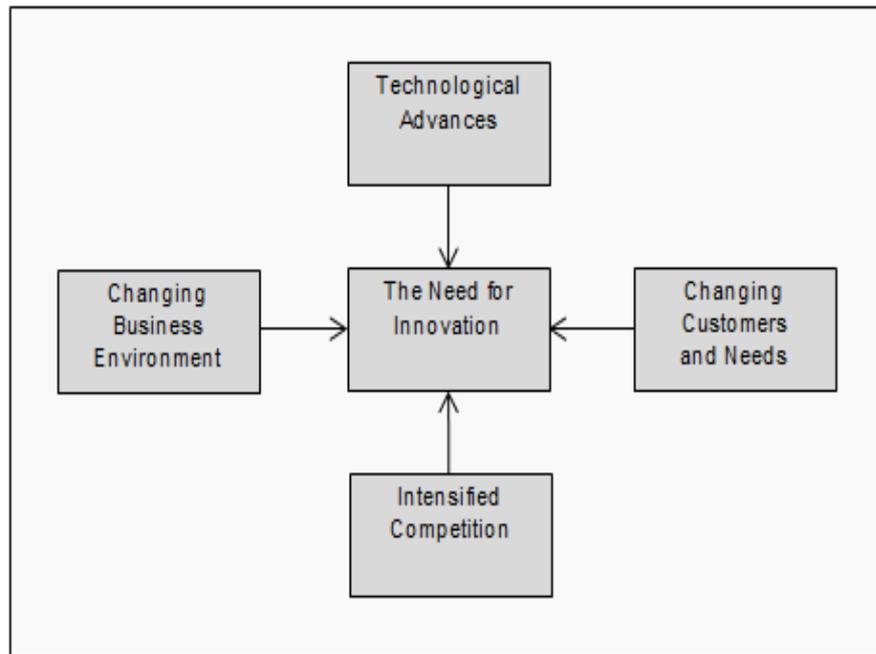


**Figure 6: The revised technology adoption life cycle (Moore, 2002, p. 17)**

While the literature on diffusion theories primarily focuses on adoption factors (e.g., relative advantage, compatibility, complexity), a less-established research stream investigates factors of innovation resistance (Garcia et al., 2007; Moore, 2002; Ram & Sheth, 1989). Innovation resistance is regarded as “the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure” (Ram & Sheth, 1989, p.6). Overcoming consumer resistance to innovations requires managers to define distinct market strategies (e.g., product strategy, and pricing strategy) that address those barriers (Ram & Sheth, 1989). For instance, companies have to modify their strategy and adapt marketing efforts to enter the mainstream market; otherwise, the innovation might be stuck in the early market phase (Garcia, Bardhi, & Friedrich, 2007; Moore, 2002; Ram & Sheth, 1989). Actually, not all innovations were immediately successful; the dishwasher and microwave languished for decades in the early adopter phase before they diffused in the mainstream market (Garcia et al., 2007; Ram & Sheth, 1989). Moore (2002) highlighted the difficulties companies face in

modifying an initial marketing approach that was successful with the early adopters so that mainstream customers will also adopt the new product (Moore, 2002; Slater & Mohr, 2006). However, “they are typically more practically minded and will adopt only when they have a clear proof that the idea really works” (Goffin & Mitchell, 2010, p. 58). To cross the chasm, Moore (2002) suggested that companies initially target a single market segment, become the dominant player in this segment, and use that success as a springboard to enter adjacent larger segments. In other words, the key is to select strategic target market segments as a starting point for further expansion (Moore, 2002). As applied to this thesis, the older-adult market can be regarded as a strategic market for new concepts to begin. For the author, it creates an entry point into larger segments.

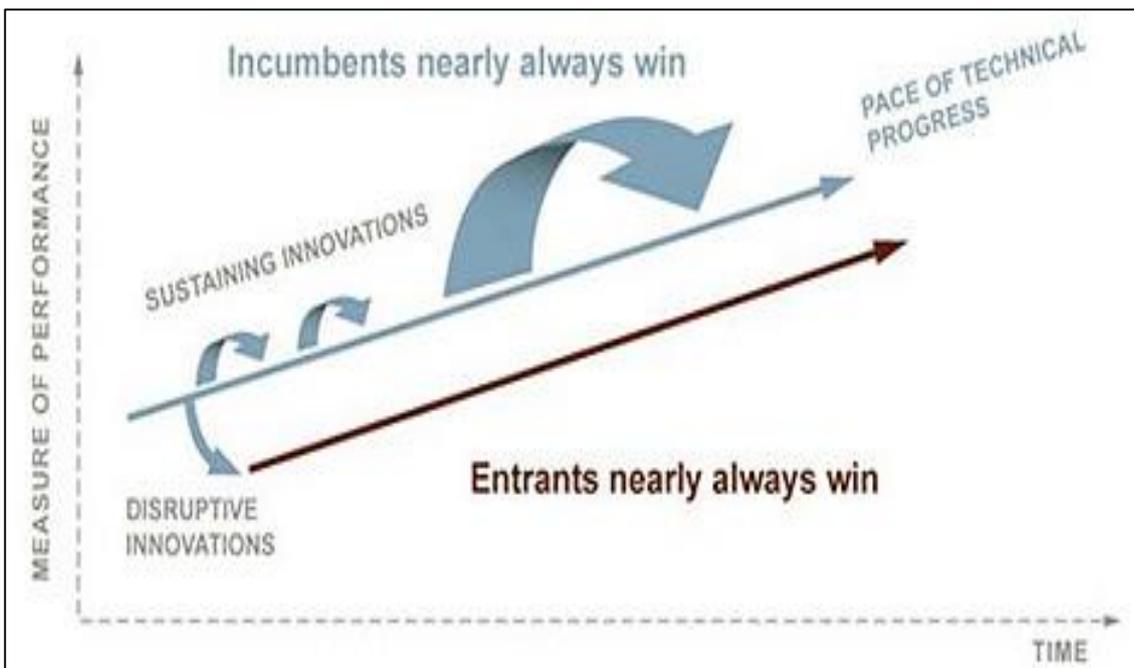
In Rogers’ model, diffusion is typically synonymous with its underlying driver communication (Golder & Tellis, 1998; Rogers, 2003). In this sense, the diffusion of a product is driven through communication across consumers. Rogers’ model recommends that managers focus on communicating the relative advantage of innovations over existing products. Ram and Sheth (1989) took a different perspective and argued that managers need to identify functional and psychological barriers that impede adoption of innovation. They related functional barriers to usage, value, and risk barriers. Other scholars (Bagozzi, 2007; Venkatesh, Thong, & Xu, 2012) underlined that some customers are resistant to innovations particularly when they require changes to habits and routines. Psychological barriers relate to traditions, norms and image barriers that impede innovation adoption (Ram & Sheth, 1989). Thus, several researchers question the basic assumption that product success is driven only by communication (Goffin & Mitchell, 2010; Golder & Tellis, 1998). This key assumption of the Rogers model can change over time due to several influences such as the changing characteristics of the population, technological advances, or economy (see figure below from Goffin & Mitchell, 2010).



**Figure 7: Drivers of innovation (Goffin & Mitchell, 2010, p. 2)**

The product definition in the Rogers model is static because it assumes that the product itself does not change over time (Golder & Tellies, 1998). However, there may be several influences within a product category itself which lead to product modifications over time (see illustration above from Goffin & Mitchell, 2010). Several researchers have departed from Rogers' framework and proposed alternative strategies (Christensen, 1997; Golder & Tellies, 1998). One such strategy relates to 'affordability' as an alternate driver. Golder and Tellis (1998) argued that most consumers know about new products long before purchasing them, but resist purchasing those products due to high prices. As a consequence, new products become attractive to the mass market only when their price drops sufficiently (Golder & Tellies, 1998). Like Christensen (1997), Golder and Tellies (1998) view affordability as a key driver of new product growth. Nearly every established company offers new products or technologies that are so expensive and complicated from the outset that only certain consumers can afford them, and only consumers with a lot of experience can use them (Anthony et al., 2008; Christensen, 1997; Christensen & Raynor, 2003; Raynor & Christensen, 2011). In an empirical study about the disk-drive industry, Christensen (1997) identified that over time market leaders were displaced by new 'inferior' technologies that turned out to be industry changing. Most of the academic studies revolve around 'sustaining innovations' in product improvements because incremental or sustaining improvements are the most

powerful and important mechanisms for a company (Norman, 2011). Typically, those improvements require a lower financial investment, are less risky, and fit the current marketing strategy (Christensen & Raynor, 2003). Christensen (1997) suggested that a disruptive innovation prospers in low-end segments or in new markets and invades the mainstream market later. In contrast to Rogers, Christensen (1997) provided a different kind of market progression of technological innovations (see black arrow in figure 8 below), broadly defined as those that introduce a different set of features, performance, and price attributes relative to existing products and technologies. A disruptive innovation introduces a competing set of features and performance dimensions relative to the existing dominant standard using a combination of product attributes that are not valued by mainstream customers upon initial introduction (Adner, 2002; Anthony et al., 2008; Govindarajan & Kopalle, 2006a). Over time, further developments improve the new technology's performance with attributes that mainstream customers do value, to a level where the new technology begins to cannibalize the existing technology (Christensen & Raynor, 2003).



**Figure 8: Disruptive innovations (source: [www.claytonchristensen.com/keyconcepts](http://www.claytonchristensen.com/keyconcepts))**

As Figure 8 above (taken from [www.claytonchristensen.com/keyconcepts](http://www.claytonchristensen.com/keyconcepts)) illustrates, disruptive innovations initially perform worse than established products (Anthony et al., 2008; Christensen, 1997, 2013; Raynor & Christensen, 2011). Due to the fast performance improvements of disruptive innovations,

market share leaders ('incumbents') are under pressure due to the fast performance improvements of these disruptive innovations. As a result, 'incumbent' companies intensify their investment towards sustaining innovations (Hüsig, Hipp, & Dowling, 2005) and unwittingly make disruptive innovations even more attractive. One implication of Christensen's work lies in the critical reflection of Rogers' diffusion theory. It suggests that the successful development and commercialisation of innovations requires different strategy types to successfully target different market segments (Slater & Mohr, 2006). The literature review showed that the ageing population is a diverse segment with different user segments (Peine et al., 2014) and varied socio-economic backgrounds (Blythe et al., 2005) like the consumption-oriented baby boomers (Niemelä-Nyrhinen, 2007; Pak & Kambil, 2006). Slater and Mohr (2006) linked Rogers' market adopter segmentation approach with Christensen's different technological strategy types. According to the authors, companies that are successful at satisfying needs in mainstream markets are more likely to develop sustaining technologies or incremental innovations. Market share leaders ('incumbents') typically focus on the early and late majority segments of the market comprising approximately two-thirds of market demand (Slater & Mohr, 2006). Those companies typically become industry leaders by appealing to a broad base of customers in the marketplace (early and late majority) and defend this position by continually meeting their needs (Slater & Mohr, 2006). In following Christensen's approach, Slater and Mohr (2006) underlined that market leaders are largely unsuccessful at entering niche markets and vice versa. As a consequence, this focus on mainstream customers (early and late majority) puts them at risk of being "out-innovated by industry newcomers" (Slater & Mohr, 2006, p. 32).

A value network is the context within which a company operates, including its cost structure and operating processes (Christensen et al., 2008; Christensen & Raynor, 2003; Raynor & Christensen, 2011). In this network, the company has established relationships with suppliers and partners in order to respond profitably to the specific market segment (Christensen et al., 2009; Christensen & Raynor, 2003). Consequently, the company can successfully commercialise their product in that specific market segment. If the established company tries to expand their product to a different market segment, like the ageing customer segment, then it might be incapable of successfully commercialising its product.

To Christensen and Raynor (2003) there are two main contexts for disruptive innovations at the low end or the bottom of a market or in a new, unfamiliar market field.

**Table 4: Comparison of low-end and new market disruptive innovation (adapted from Hang et al., 2014)**

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Low-end disruption	Establishes its foothold with lower price and ancillary features among customers at the lower end of the original value network.  Customers for whom the incumbent's offering has excess functionality and is unaffordable.
New market disruption	Starts in a new value network with new performance measures.  Attracts new customers who had not owned or used the prior generation of products or services.

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The diffusion perspective on disruptive innovation has been further developed by several other scholars (Anthony et al., 2008; Schmidt & Druehl, 2008). To Yu and Hang (2010) market disruption is not an event at a given time but occurs as an outcome of a specific market diffusion process. Typically, disruptive innovations will enter mainstream market segments from the low end. In this line of thought 'low-end customers' show a higher 'readiness' (are more 'susceptible') to the performance proposition offered by the innovation (Hüsig et al., 2005; Klenner, Hüsig, & Dowling, 2013). Schmidt and Druehl (2008) stated that: "The low end of a product's market is defined to consist of those customers with the lowest willingness to pay for the product (they have the lowest demand for the product's key performance attributes)" (p. 350). In contrast, high-end customers have the highest demand requirements for performance improvements. As a result, high-end customers are generally the last adopters of disruptive innovation since they have the highest capacity to absorb performance improvements of dominant innovations (Schmidt & Druehl, 2008). Mainstream customers occupy a position between the two extremes of low-end and high-end customers. As the performance of a mainstream product increases, it eventually surpasses the (older) customer expectations and creates a potential business opportunity into which simpler and more convenient product concepts can enter (Christensen & Raynor, 2003). In case

of low-end disruption, the initial consumers are price-sensitive consumers. Thus, lower-priced disruptive innovations are improved over time and overtake the existing technology. In the context of household appliances this pattern can be observed in the historic development of the category of vacuum cleaners. Here, over time initially low quality ‘bagless’ models, which do not require dust bags, gained market share from traditional ‘bagged’ vacuum cleaner manufacturers. Table 5 summarizes the different approaches.

**Table 5: Three approaches to create new-growth opportunities (Christensen & Raynor, 2003, p. 51)**

Dimension	Sustaining Innovations	Low-End Disruption	New-Market Disruption
<b>Targeted performance of the product or service</b>	Performance improvement in attributes most valued by the industry’s most demanding customers. These improvements may be incremental or breakthrough in character.	Performance that is good enough along the traditional metrics of performance at the low end of mainstream market.	Lower performance in “traditional” attributes, but improved performance in new attributes- typically simplicity and convenience.
<b>Targeted customers or market application</b>	The most attractive (i.e. profitable) customers in the mainstream markets who are willing to pay for improved performance.	Over-served customers in the low end of the mainstream market.	Targets non-consumption: customers who historically lacked the money or skill to buy and use the product.
<b>Impact on the required business model (processes and cost structure)</b>	Improves or maintains profit margins by exploiting existing processes and cost structure and making better use of current competitive advantages.	Utilises a new operating or financial approach or both-a different combination of lower gross profit margins and higher asset utilisation that can earn attractive returns at the discount prices required to win business on the low end of the market.	Business model must make money at lower price per unit sold, and at unit production volumes that initially will be small. Gross margin dollars per unit sold will be significantly lower.

Govindarajan and Kopalle (2006a, 2006b) supported Christensen’s framework (see Table 5), but suggested making a distinction between high-end and low-end disruptiveness. To them, low-end disruptions start their lifecycle in lower-price segments of the market, appealing to price-sensitive customers. High-end disruptions are typically more radical in their novelty and compete with existing products or services not on price or cost, but by offering distinctive features (Govindarajan & Kopalle, 2006a, 2006b). The concept of high-end and low-end disruptiveness is closely related to the classical diffusion theory of Rogers (2003), especially in the case of high-involvement products like electrical household products. Schmidt and Druehl (2008) offered an alternative terminology and framework that illustrates the direction of diffusion, e.g., starting

from high-end or low-end market segments, with the type of innovation in terms of its novelty (see Table 6).

**Table 6: Types of innovation (Schmidt & Druehl, 2008, p. 348)**

Type of innovation	Types of diffusion to which it maps	Description	Examples (author)
Sustaining	High-end encroachment	The new product first encroaches on the high end of the existing market and then diffuses downward.	Heat pump dryers Robot vacuum cleaners
Disruptive	Low-end encroachment	The new product first encroaches on the low end of the existing market and then diffuses upward.	Bagless vacuum cleaners Samsung washing machines
New-market Disruption	Fringe-market low-end encroachment	Before encroachment begins, the new product opens up a fringe market (where customer needs are incrementally different from those of current low-end customers)	Airbnb Netflix
	Detached - market low-end encroachment	Before encroachment begins, the new product opens up a detached market (where customer needs are dramatically different from those of current low-end customers).	The Open University
Low-end Disruption	Immediate low-end encroachment	Low-end encroachment begins immediately upon introduction of the new product.	Zalando (relative to traditional shoe retailers) Discounter Aldi (relative to department stores)

There has been a growing interest in academia in disruptive technologies or disruptive innovations as illustrated in the table below (disruptive innovation or disruptive technology in the article title).

**Table 7: Number of academic papers**

Database Search Period	Science Direct	EBSCO	Emerald	Google scholar
2000 – 2004	1	56	8	52
2005 – 2009	19	107	12	213
2010 – present	35	122	17	427

Anthony et al. (2006) pointed to a common misconception that a great leap forward in performance of a technology is synonymous with disruption. Breakthrough innovations promise significant improvements in performance compared with existing products. Latzer (2009) drew commonalities to Schumpeter (1942) who argued that economic growth in a capitalist regime happens through creative destruction, a process where the old is continuously being destroyed, and thereby freeing resources for the new. It seems the same kind of 'creative destruction' which leads to technological discontinuities happens right now in our homes enabled by "The Internet of Things" (KPMG, 2014). As such, it appears that in the homes, the digital technologies force people "to reconfigure the home as living space" (Venkatesh, 2008, p. 5).

A main criticism of Christensen's theory is the retrospective nature of case analyses used to derive the theory (Paap & Katz, 2004; Selhofer et al., 2012; Sood & Tellis 2010) and the lack of consumer orientation (Adner, 2002; Yu & Hang, 2010). It seems then, that despite almost two decades of research about disruptive technologies, the ambiguous interpretations of the case study-based findings speak more to the methodological challenges than to a relationship between types of disruptive technologies and their potential application to the segment of elderly customers. In this study, the author attempts to address these methodological gaps by designing an observational and interview-based study that incorporates a direct involvement of older adults in the assessment of innovation potentials.

Many researchers have commented on the lack of understanding with regard to the underlying factors that drive the process of market disruption (Danneels, 2004; Sood & Tellis, 2010). Furthermore, the terms disruptive technology and disruptive innovations are mixed up and used simultaneously (Schmidt & Druehl, 2008). However, they refer to different areas of interest. Problems with defining disruptive innovation cause confusion in how disruptiveness is operationalized (Govindarajan & Kopalle, 2006a, 2006b). According to Linton (2009), "the greatest potential source of confusion regarding the language of innovation appears to be that of perspective" (p. 730). The result from this research will provide a significant contribution to knowledge to the development and Steen (2013) linked the application of disruptive innovation (Christensen, 2013; Christensen & Raynor, 2003) to those involved with the development of

social innovations like BoP projects (Prahalad, 2005). This type of innovation focuses on offering innovative products and services at relatively low price points, with relatively cheap production technologies. “A relatively large portion of our attention typically goes to serving the top of the pyramid, rather than serving the base.” (Steen, 2013, p. 26). Base-of-the-Pyramid (BoP) innovation projects aim to design, produce, and market products and services for large and relatively poor market segments in developing countries (de Boer, Steen, & van Sandick, 2012; Prahalad, 2005). As a matter of fact, this ‘lower’ end is ignored by many companies that focus on ‘higher’ end and incremental innovation (Prahalad, 2005). The BoP approach is not based on charity, but on creating fundamentally new business models and encouraging the involvement of local businesses (Prahalad, 2005). According to de Boer et al. (2012): “... BoP projects are ‘special’ in a way that they combine commercial entrepreneurship and commercial goals with social and local entrepreneurship and social goals” (p. 5). It seems critical for BoP projects to focus on increasing people’s capabilities, while organizing and managing the project. Innovation that directs the attention to *Creating Capabilities* (Nussbaum, 2011) focuses on people’s development and freedom. Nussbaum (2011, p. 33) referred to a list of 10 human life areas in which a minimum threshold level is required including life, bodily health, bodily integrity, senses / imagination / thought, emotions, practical reason, affiliation, other species, play and control over one’s environment. However, to develop mass market innovations for these areas belongs to a still emerging field (Mulgan, Tucker, Rushnara, & Sanders, 2007; Murray, Caulier-Grice, & Mulgan, 2010). In contrast to BoP projects, disruptive innovation does not necessarily follow a social goal.

### **Existing customer markets versus emerging customer markets**

Focussing exclusively on existing customers could cause a company to ignore potential customers, which could lead to missed market opportunities (Chesbrough, 2010; Christensen & Raynor, 2003; Danneels, 2004; von Hippel, 2005). In contrast, an orientation purely towards an emerging, ‘niche’ customer segment with low market volumes, requires an allocation of resources behind new product opportunities, which might not be a financially viable business opportunity for many established multinational companies (Chesbrough, 2010). One very important consequence of the orientation is the type of products a

company develops. In particular, the distinction between radical and disruptive innovations seems to be fundamental. A radical innovation is a new product that is based on a substantially new technology relative to what already exists (Markides, 2006; Selhofer et al., 2012), and is sometimes targeted at the mainstream market and/or toward an emerging market (Govindarajan, Kopalle, & Danneels, 2011). In contrast, “disruptive innovations are initially targeted at an emerging market” (Govindarajan et al., 2011, p. 121), which would make them appropriate for the ageing segment. Govindarajan et al. (2011) delivered insights into the innovation consequences of these customer orientations by examining their effects on disruptive innovation and radical innovation. The authors’ findings suggest that companies that are focused narrowly on serving current customers will not have disruptive innovations, potentially putting them at risk from such innovations introduced by competitors. In contrast, an orientation toward emerging customer segments has a positive effect on the disruptive innovations, but is not related to radical innovations (Govindarajan et al., 2011).

**Table 8: Mainstream and emerging customer orientation**

		Mainstream customer orientation	
		Low	High
Emerging customer orientation	Low	Low radical innovation Low disruptive innovation.	Low disruptive innovation
	High	High disruptive innovation.	High radical innovation High disruptive innovation

In sum, influential scholars (Chesbrough, 2010; Govindarajan et al., 2011) acknowledged that a mainstream customer orientation requires a combination with an emerging customer orientation for the pursuit of disruptive innovation. Therefore, also the organizational implications for established companies entering an emerging ageing segment need to be addressed in this thesis.

### **Disruptive innovation to overcome innovation resistance among older consumers**

A primary driver of innovation is the changing characteristics and requirements of 'overlooked' new customer segments. In the field of innovations, the household is playing a greater role because issues such as ageing are coming to the forefront. Wolfe and Snyder (2003) viewed the segment of older adults as the "new customer majority" (p. 15); the authors suggested "it is the only adult market with realistic prospects for significant sales growth in dozens of product lines ..." (p. 21). The positive social side effects of disruptive innovations are stressed by Kohlbacher and Herstatt (2011), who urged more research on this matter particularly related to older people. More attention is required to address the informal household sector including individuals, families and networks (Murray et al., 2010), which has generally been under-recognized as a source of social innovations. Further, scholars from various disciplines underline that it is critical to realise that the ageing market is not to be misunderstood as a homogenous market but rather as a diverse conglomerate of many submarkets (Herstatt et al., 2011; Joyce & Loe, 2010; Kohlbacher et al., 2014; Wolfe & Snyder, 2003), which requires a better understanding of the implications for innovation management and the applied strategies.

On the one hand, people are getting older and the need for care is increasing. On the other hand, the group of (young) caregivers is decreasing. Therefore, the use of technical devices in the field of health and social care plays a key role in the discussion concerning the development of society and age structure (Kruse et al., 2012; Mollenkopf et al., 2010). Promising as this approach might be, Christensen et al. (2006) underscored that "just because an organisation has come up with a good idea for systemic social change doesn't mean that it will succeed in implementing that change" (p. 101), which requires an assessment of whether the concept has a good chance of creating scalable, sustainable innovations in social change. The author found only a few articles on older customers and entrepreneurial opportunity, although this customer group is rapidly growing and affecting many countries worldwide (Kohlbacher & Hang, 2011; Kohlbacher & Herstatt, 2011). Considering the importance of this customer segment that has to be served, it is surprising that there is limited

research on how companies and entrepreneurs recognize opportunities in the ageing segment (Kohlbacher et al., 2014; Levsen & Herstatt, 2014).

The starting point in the creation of a business model is the value proposition (Christensen & Raynor, 2003; Osterwalder & Pigneur, 2011) – a product or service that can help targeted customers do a job they have been trying to do, more effectively, conveniently, and affordably (Christensen & Raynor, 2003; Christensen et al., 2009). Typically managers need to put in place a set of resources (including people, products, facilities, etc.) required to deliver that value proposition to the target customers. In repeatedly working toward that goal, processes merge that form habitual ways of working together that emerge as employees address recurrent tasks repeatedly. These processes define how resources are combined to deliver the value proposition which is the most critical component to define the profit formula which relates to the required market price, mark-ups, gross and net profit margins (Christensen et al., 2009). A case-based study about disruptive innovations (based on expert interviews) conducted by Herstatt et al. (2011) found the need for autonomy-enhancement to be the overarching theme. The authors related the findings to two separate aspects of autonomy: the independent use of a product and the aim for specific autonomy enhancements, e.g., regaining the ability to walk around unassistedly. Within a case study framework, Kohlbacher et al. (2014) used qualitative interviews with entrepreneurs and managers to collect data and found:

The overarching theme of the selected case studies is the development of products and services to address and support the specific needs of older people. Opportunities are created whenever existing solutions in the respective markets do not sufficiently meet these needs. (p. 6)

However, these case studies focus mainly on gerontechnologies, which are innovations for older adults designed to compensate for age-related declines and lack the direct involvement of older adults. This omission is criticized by sociologist Loe (2015) who pointed out that older adults need to be involved in design and policymaking in order to value their life experiences and preferences. Additionally, the case-based studies neglect the context-of-use and the ‘embodiment of users,’ which seems to be important when it comes to facilitating domestic practices in later life. It seems to be a major research gap

that will be discussed further throughout the study. As a matter of fact, the “voice of the customer” (Goffin, Varnes, van der Hoven, & Koners, 2012) is not heard, it remains a ‘blind spot’ in their case-based research if the selected product categories (e.g., E-bikes) and the identified value proposition is also relevant from the customer perspective. This is surprising because according to gerontologists (Joyce & Loe, 2010; Loe, 2014) context of use is crucial when analysing gerontechnologies. All case-based studies about disruptive innovation for elderly adults overlook mundane daily activities. This research field is important (Loe, 2015) because being able to age-in-place means being able to perform domestic activities despite age-specific constraints, even with the support of technology (Gaßner & Conrad, 2010). According to Gaßner and Conrad (2010), “Certain technologies promise to maintain an independent and autonomous life of elderly persons within their domestic area even though they may face certain health barriers” (p. 15). Disruptive innovation is considered by practitioners and researchers as a “powerful means for developing and broadening new markets” (Govindarajan & Kopalle, 2006a, p. 190) and to disrupt developed markets (Christensen et al., 2008; Howitt et al., 2012). Disruptive innovations have frequently been discussed to make health care more cost effective (Christensen et al., 2009; Howitt et al., 2012), especially in countries with high-cost health systems. To explore the application of disruptive innovation is appropriate because countries like Germany are facing increasing costs for healthcare and the long-term consequences of an ageing society (Köcher & Bruttel, 2013; Kruse et al. 2012; Mollenkopf et al., 2010). In that respect, disruption addresses the more fundamental question: How do we make elderly care more affordable? Scholars proposed the application of disruptive innovations to the emerging market of ageing consumers, which offers ‘golden opportunities’ (Kohlbacher et al., 2014; Yu & Hang, 2010) for companies. Although older adults might be the primary beneficiaries of cheaper and simpler technology, such products might also be attractive for other (low income) market segments or could be exported to low-income, developing countries, which requires a global strategy (Govindarajan & Ramamurti, 2011). The reason for choosing this type of innovation lies in the key aspect and promise that disruptive innovation addresses. According to Christensen et al. (2009): “Politicians are consumed with how we can afford health care. But disruption

solves the more fundamental question: How do we make health care affordable?” (p. xlv)

In many aspects, this question applies to elder care (Howitt et al., 2012; Mollenkopf et al., 2010; Yu & Hang, 2010). Although, a breadth of empirical studies in the context of population ageing exists (Coughlin et al., 2007; Kohlbacher & Herstatt, 2011; Mathur et al., 2005; Wolfe & Snyder, 2003), insufficient attention has been given to empirical studies on disruptive innovation and entrepreneurial opportunity in the context of the domestic domain. This is rather surprising because as early as 1985 Drucker listed demographic change as one of the seven sources of innovative opportunity. However, “innovations mean change to consumers, and resistance to change is a normal response that has to be overcome before adoption may begin” (Laukkanen et al., 2007, p. 420). Several scholars (Jakobs et al., 2008; Joyce & Loe, 2010; Loe, 2015; Neven, 2010) clearly indicated that alternative approaches are required that lead to a critical reflection of the “chasing newness understanding of innovation” (Gomez, 2015, p. 10). Thus, disruptive innovation needs to be considered for an ageing consumer market (Herstatt et al., 2011; Kohlbacher & Chéron, 2012; Kohlbacher & Hang, 2011) to overcome barriers of adoption. Despite two decades of research in disruptive innovation, little attention has been given to considerations of different customer typologies. This is surprising because disruptive innovations initially offer lower performance in the key performance attributes compared to mainstream products (Anthony et al., 2008; Christensen & Raynor, 2003; Herstatt et al., 2011, Kohlbacher et al., 2011) that might be rather unfamiliar to some customers. Thus, when it comes to identifying the older adults’ preferences for product characteristics (Rogers & Fisk, 2010) or the relative advantage of a product (Rogers, 2003), the acceptance of disruptive innovations must be clarified (Adner, 2002). If technological innovation creates an improvement in performance, which provides a relative advantage versus the existing technology, then disruptive technologies cannot be put on the same level (Johnson, Christensen, & Kagermann, 2008; Christensen et al., 2008). As mentioned by Norman (2011, p. 55), “features win over simplicity” even if the consumer realizes they will probably never use most of the features. This research will explore whether and how disruptive innovations might create value for the elderly, or certain segments of older adults, and how those offerings

could shape competition in industries (Govindarajan et al., 2011; Klenner et al., 2013).

### 2.4.2 Technology acceptance models

Studies in the field of innovation adoption are based mainly on the behavioural models like the technology acceptance model (Davis, 1989). The technology acceptance model (TAM) is widely acknowledged and is still influential for many works in the field of innovation acceptance. Numerous empirical studies have confirmed that it is a robust model for explaining acceptance behaviour across subjects and different kinds of technologies and products (Chen & Chan, 2011; Jakobs et al., 2008; Mitzner et al., 2010). The TAM (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) builds on two important factors in explaining the acceptance and usage of a technology: the perceived usefulness and the perceived ease of use. Perceived usefulness and perceived ease of use predict usage behaviour directly and indirectly through the mediation of attitude toward using a technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). The model (see figure below) suggests that when users are presented with a new technology, two factors influence their actual behavioural intention to use it. Davis (1989) defined perceived usefulness as: "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). The perceived ease of use was defined as: "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 320).

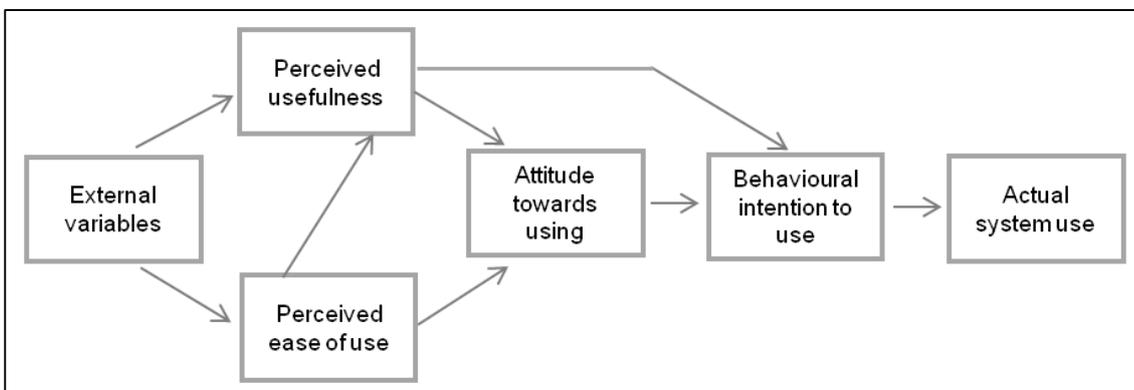


Figure 9: Technology acceptance model (Davis, Bagozzi, & Warshaw, 1989, p. 985)

Although TAM has been available since 1989 it is still in use as a key model to explore the technology acceptance in some of the articles selected. It has been tested, refined, and extended exhaustively over recent years (e.g., Jakobs et al., 2008; Mitzner et al., 2010; Renaud & van Biljon, 2008). Scholars from various disciplines contributed to the field of technology acceptance by investigating the influences of perceived usefulness and perceived ease of use as well as the independent effect of perceived usefulness on the behavioural intention (Venkatesh et al., 2003). Venkatesh et al. (2003) stated: "The role of intention as a predictor of behaviour is critical and has been well-established in IS and the reference disciplines" (p.427). TAM posits that actual behaviour results from an individual's attitude toward the behaviour in question. Conversely, previous studies emphasize that habits, routines, and structures in which daily activities are embedded play a significant role in technology use (Feldmann & Orlikowski, 2011; Pink, 2004; Ram & Sheth, 1989; Shove et al., 2012; Warde, 2005). In other words, TAM neglects the factor that consumers experience usage barriers when an innovation conflicts with existing usage patterns (Ram & Sheth, 1989). This also questions the underlying assumption, which suggests: "the intention to perform behaviour can be predicted with high accuracy from attitude to perform behaviour" (Ajzen, 1991, p. 179). Through focus group sessions, Mitzner et al. (2010) found that older adults have more positive than negative attitudes towards the technology they currently use. It seems that through 'domestication,' technical objects that originally alienated individuals became familiar objects once they were introduced into a home (Peine & Neven, 2011). As Peine and Neven (2011) stated: "Domestication is a complex process where users create a physical space and temporal routines for a new technology and establish its particular meaning and relevance, which becomes the background against which the usefulness of a technology is evaluated" (p. 134). For all the practical purposes, TAM has become out-dated and less relevant for the current thesis because attempts to change behaviour rest on a narrow view of social life (Hargreaves, 2011). As TAM neglects the context of use, the physical burden or the embodiment of consumers (Lai et al., 2008) is not sufficiently understood. Although the TAM is highly valuable as a starting point and orientation for this research, it lacks sufficient explanatory power because it does not address routines, context-of-use, and social

influences (e.g., traditions and norms) that might lead to adoption barriers (Chen & Chan, 2011, Ram & Sheth, 1989).

An alternative view is provided by Bolton and Lemon (1999) who developed a dynamic model (see figure below) of customer usage of services which links customer’s prior usage levels, satisfaction evaluations, and subsequent service usage. The authors introduced the construct of payment equity to explain how customers’ satisfaction evaluations and service usage levels vary over time.

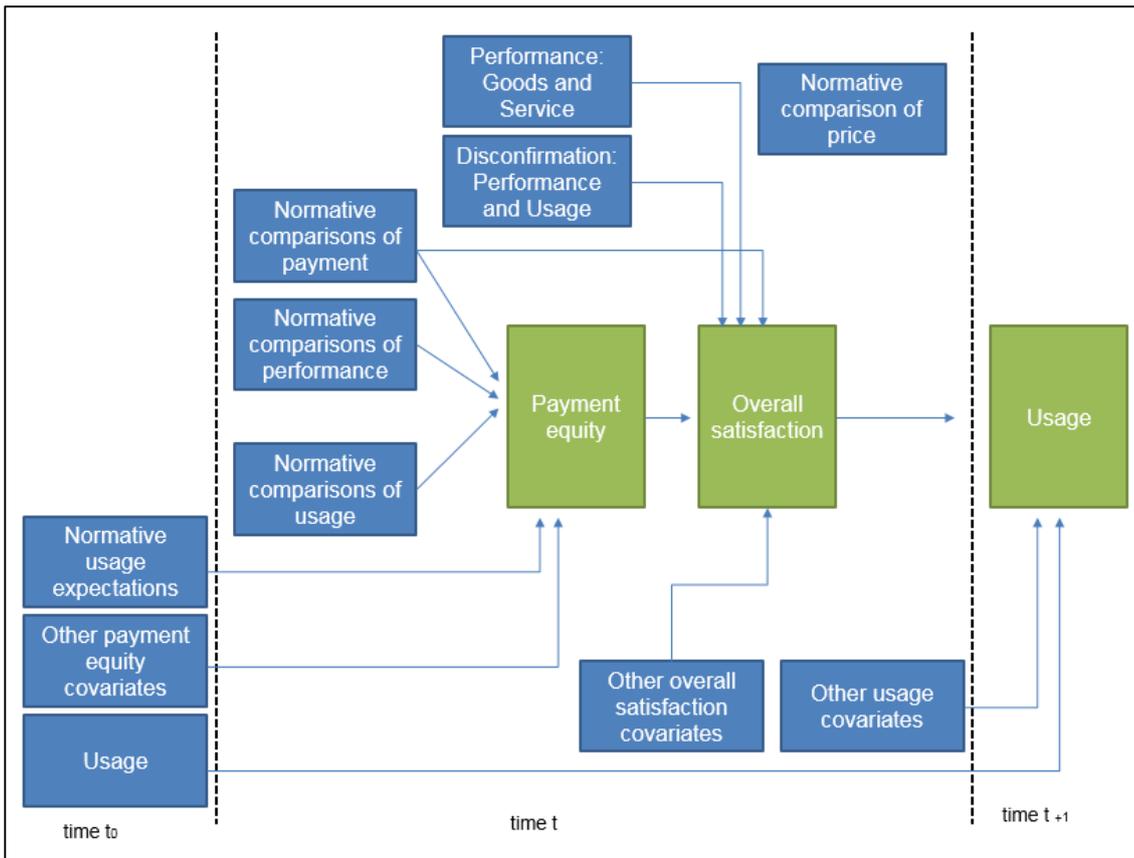
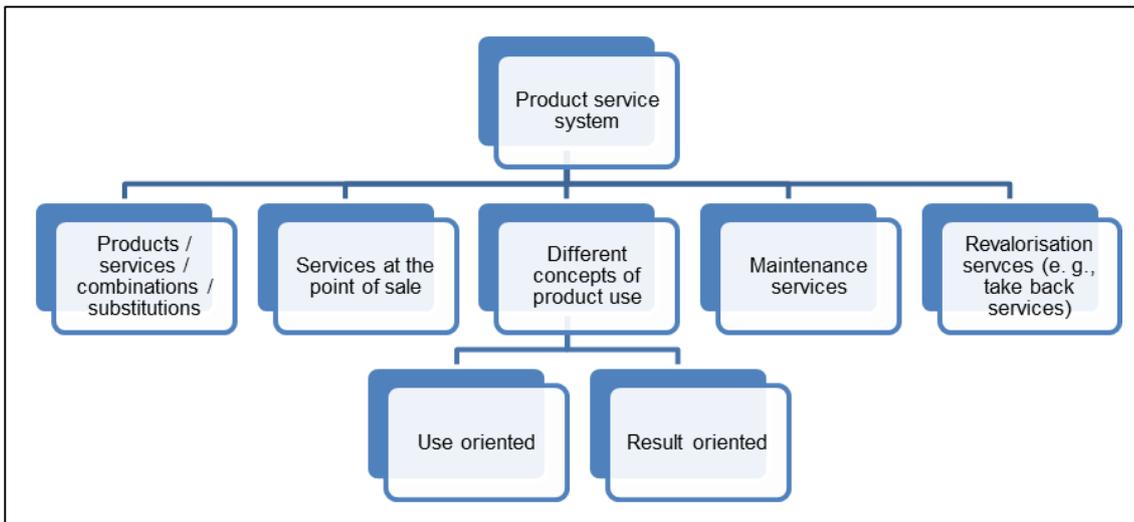


Figure 10: The dynamic model of usage (adapted from Bolton & Lemon, 1999)

Bolton and Lemon (1999) suggested a provider-customer perspective, which includes a payment plan that can entail an initial payment (e.g., membership fee) or a monthly service charge, or some combination of both payment forms. The model proposes that customers make evaluations about payment equity by comparing their current payment and usage levels with normative (“should”) expectations (Bolton & Lemon, 1999). In evaluating payment equity, Bolton and Lemon (1999) proposed that customers make comparisons: “Customers will compare their current usage levels with their normative expectations of usage” (Bolton & Lemon, 1999, p. 174). Payment equity plays a dominant role in the

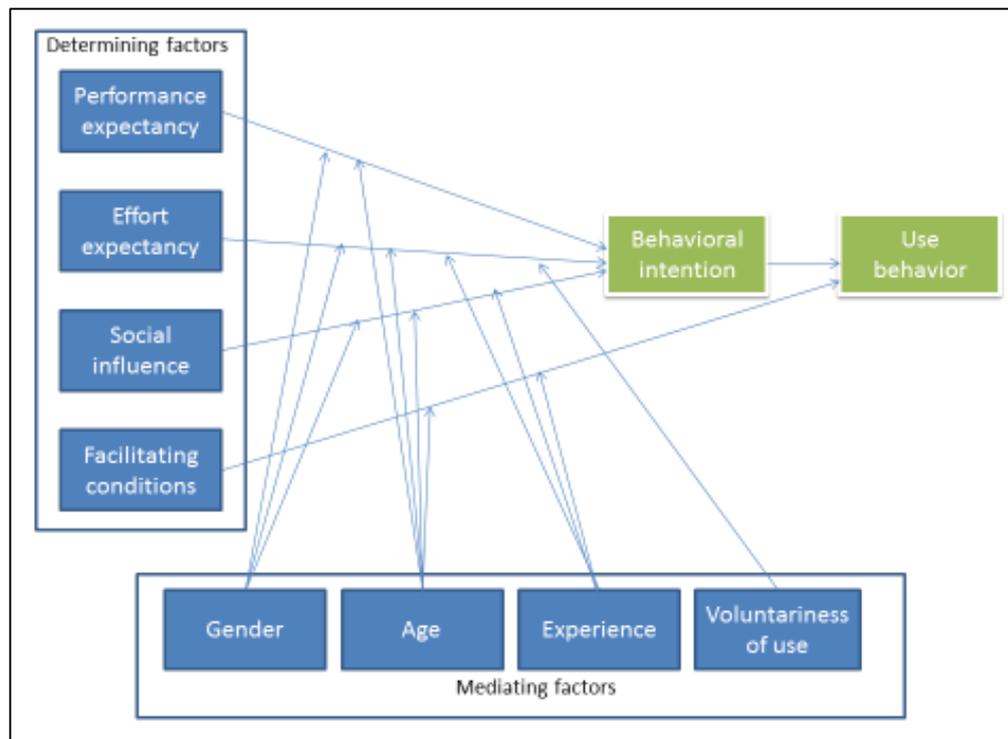
dynamic model by explaining how usage levels and price influence customer satisfaction, thereby influencing subsequent usage levels (Bolton & Lemon, 1999). However, the model assumes a homogenous market and neglects different market segments and income levels. As such, the usage level of services might vary within the group of older adults due to different financial constraints. Although the model focuses on actual usage, it was only tested for “continuously provided services” (Bolton & Lemon, 1999, p. 171). As the model was tested only on services it may not work as well on other categories like consumer durables. This limits the field of application in a significant way because typically the acquisition of household appliances does not include continuously provided services including payment plans. As such, it does not apply to companies which mainly follow a traditional ‘ownership-based’ business model. In addition, the model of Bolton and Lemon (1999) does not consider different market segments. Thus, it has limited value for the current research. As the model is related to services, it might offer valuable insights for marketing managers concerned with new business concepts such as product service systems (PSS). “A PSS should be defined as a system of products, services, supporting networks, and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional models” (Mont, 2001, p.3). Typically, it is based on users paying for the benefit of using a product without needing to own the product and is mainly discussed in the literature as a potential means to lower environmental impacts (Beuren, Ferreira, & Miguel, 2013; Botsman & Rogers, 2010; Mont 2001). However, market strategies, which depart from ownership of appliances (Belk, 2014; Botsman & Rogers, 2010; Matzler, Veider, & Kathan, 2015; Mont, 2001), could also be considered to overcome the value or risk barrier (Ram & Sheth, 1989) of older consumers. A product service system could consist of products, services (e.g., maintenance service, take back service) or combinations of both (Mont, 2001). The following figure provides an overview of the main PSS elements (Mont, 2001).



**Figure 11: Classification of product service systems (Mont, 2001, p. 5)**

There is a widespread view in academia that “consumers are unaccustomed to using products without owning them” (Beuren et al., 2013, p.229). Therefore, it is important to examine barriers (Mont, 2001) and potential user segments of PSS prior to its development and application.

Venkatesh, Morris, Davis, & Davis (2003) reviewed eight models and discussed their similarities and differences. They developed The Unified Theory of Acceptance and Use of Technology (UTAT), which explains user intention and subsequent behaviour through the influence of direct determinants and mediating factors. Whereas TAM includes “attitude towards using technology” (Venkatesh et al., 2003, p. 447), UTAT omits this as a direct determinant and introduces a range of constructs directly determining use behaviour namely performance expectancy, effort expectancy, social influence, and facilitating conditions. These four direct determinants were derived from a synthesis of earlier models (Lee, 2014). As an example, performance expectancy relates to the relative advantage of a product as described in the Theory of Diffusion of Innovation (Lee, 2014; Rogers, 2003). UTAT contributes to earlier models because it includes factors (gender, age, experience, and voluntariness) that mediate the impact of the above mentioned constructs. As the below figure shows, the behavioural intention to use is influenced by the rather complex relationship of direct determinants and mediating factors.



**Figure 12: Unified theory of acceptance and use of technology (adapted from Lee, 2014; Venkatesh et al., 2003)**

It should be emphasized that the validation of the model was based on self-reported perception of technology use in the workplace, and does not apply to a consumer home setting of older adults. As illustrated in the figure above, “UTAT and related models hinge on intentionality as a key underlying mechanisms that drives behaviour” (Venkatesh et al., 2012, p. 161). However, in daily life it is necessary to consider various psychological and functional barriers (Ram & Sheth, 1989) that exist between intention and behaviour (Bagozzi, 2007). Bagozzi (2007) criticized the technology acceptance models because they rest on an intention-behaviour linkage (like UTAT) that treat usage behaviour as a terminal goal. As such, they fail to consider that many actions are taken not so much as ends, but rather as means to more fundamental goals. To Bagozzi (2007), technology and adoption models neglect goal striving: “in goal striving, intention formation is succeeded by planning (e.g., when, where, and how to act instrumentally), overcoming obstacles, resisting temptations, monitoring progress to goal achievement, readjusting actions, maintaining effort and willpower, and reassessing and even changing goals and means” (p. 24). A similar process of planning, monitoring, and readjusting applies to many domains and technologies, like domestic laundry appliances. Here the use of the washing machines is only a means to the more fundamental goal of having

clothes to wear and getting dressed. “These processes fill the gaps between intention and behaviour and between behaviour and goal attainment are crucial for the successful adoption and use of technology” (Bagozzi, 2007, p. 25). An important element of UTAT is distinguishing between factors determining use behaviour and factors mediating the impact of these constructs (Bagozzi, 2007; Renaud & van Biljon, 2008). In contrast to previous studies (Rogers, 2003), the work by Venkatesh et al. (2003) confirms this thesis in the way that it suggests that age plays a significant role for technology use because age mediates the effect of all four determinants on behavioural intention to use. However, “Age has received very little attention in the technology acceptance research, yet our results indicate that it moderates all of the key relationships in the model” (Venkatesh et al., 2003, p. 469). A problem with moderating effects is that little theoretical insight is offered behind the assumed interaction effects (Bagozzi, 2007). It seems an oversimplification to assume that the mediating factor ‘age’ has the same impact among the rather heterogeneous segment of older adults. In addition, the mediator ‘age’ cannot differentiate people who are different in physical functions or psychological performance (Chen & Chan, 2011). As such, different biophysical (e.g. cognitive decline) and psychosocial (e.g., social isolation) characteristics of older adults need to be considered (Chen & Chan, 2011). Overall, the study by Venkatesh et al. (2003) underlined the need to further explore innovation resistance among older adults and the diversity of an ageing segment in particular.

Traditionally, technology adoption models like TAM and UTAT were developed from a positivistic epistemology (Renaud & van Biljon, 2008) and rooted in the assumption that consumers evaluation of product attributes results in the formation of positive or negative attitudes toward an technology, which determines the decision to adopt a new product (Claudy et al., 2015). The Use Diffusion model (Shih & Venkatesh, 2004) offers a different perspective, because it aims to specify the determinants of post-implementation usage. The model, which was derived from a quantitative study about computer usage, is more user-oriented as compared to the previous models because the variable of interest is use or, more specifically, rate of use and variety of use. That factor makes a highly relevant starting point for exploring opportunities in an elderly customer segment that is highly diversified regarding technology use. The table below presents the key differences between the adoption of innovation

perspective by Rogers (2003) and the use diffusion model proposed by Shih and Venkatesh (2004). The models share some common constructs: innovativeness, social communication, complexity, media influence, and relative advantage. However, these constructs are not identical in their context. There are also significant criteria that differentiate the models.

**Table 9: Comparison of theories (Shih & Venkatesh, 2004, p. 60)**

Model	Variable of interest	Typology of population	Relevant criteria	Elements unique to each model	Elements common to both models
Use-Diffusion Model (UD model) Shih & Venkatesh (2004)	Use	Intense users Specialised users Non-specialised users Limited users	Rate of use and variety of use	Product experience Competition for use Sophistication of technology Satisfaction	Innovativeness Social communication Complexity Influence of media
Diffusion of Innovation (DOI) Rogers (2003)	Adoption	Innovators Early adopters Late majority Conservatives	Timing or rate of adoption	Observability Compatibility Triability	Relative advantage

In contrast to DOI, the UD model makes explicit the experience with technology (positive and negative). It includes competition for use (among multiple users), sophistication of technology, and satisfaction from use. Shih and Venkatesh (2004) regarded variety of use as a theoretically rich construct for application in new product development and design. To the authors, the product-use patterns determine the formation of segments, a fourfold typology of users which is a constructive way to visualise the market and to emphasize different user patterns. “In the UD context, intense users may be considered use innovators par excellence because they score high on both variety and rate” (Shih & Venkatesh, 2004, p. 69).

The framework consists of three key components: determinants, use patterns, and outcomes. Although all the components are integrated into the model, the usage patterns play a key role in it. Shih and Venkatesh (2004) conceptualized usage as being comprised of two distinct dimensions: variety of use and rate of use as dependent variables. According to the authors, the combination of

variety of use (low/high) and the use rate (low/high) yields a fourfold typology of use: intense, specialized, non-specialized, and limited, which will be applied to the current research. To them, intense use describes a situation in which a product is used to a significant degree in terms of both ‘variety of use’ (number of features, programmes used) and ‘rate of use’ (time spent per week). Typically, everyday technologies like household appliances (e.g., dishwashers, vacuum cleaners, washing machines) are used daily or weekly (Friesdorf & Heine, 2007; Jakobs et al., 2008). With specialized use, the rate of use is high, but the user does not use the full capabilities of the appliance and uses programmes routinely (Shih & Venkatesh, 2004). Non-specialized use refers to a pattern of use in which variety of use is more critical than rate of use (Shih & Venkatesh, 2004). As an example, it can be expected that some elderly users prefer washing machines offering special wash programmes, e.g., for outdoor clothes or sportswear. Finally, limited use refers to a low variety of use and a low rate of use; in this line of thought, some elderly users might find little, if any, worthwhile use application and will ‘downgrade’ the product to a relatively minor role in daily life (Shih & Venkatesh, 2004).

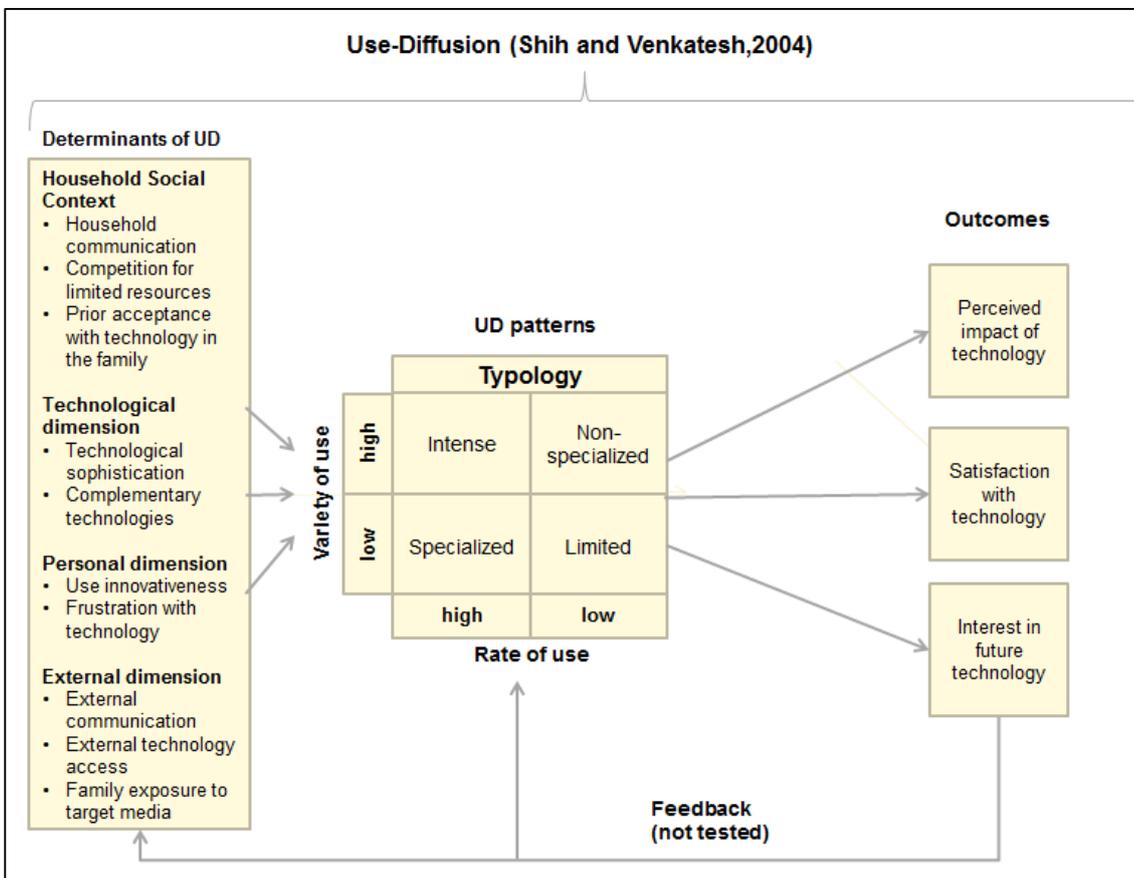


Figure 13: Use and diffusion framework (Shih & Venkatesh, 2004, p. 60)

### **Determinants**

Shih and Venkatesh (2004) presented four determinants that may affect the pattern of use. First, the household social context stresses the importance of interpersonal communication. When the user can discuss questions with others, particularly with more knowledgeable users, information can be quickly exchanged to overcome difficulties in using technology (Kieseler & Lee, 2011; Rogers, 2003). In contrast, when users are unable to resolve a situation alone, they may be discouraged and either limit the amount of time spent on technology or reject it (Shih & Venkatesh, 2004). In addition, people do not necessarily compete for how to use the technology (variety) but for how much time to allocate in using the technology (Kieseler & Lee, 2011). Thus, competition affects rate of use, not variety of use. Second, technological sophistication is part of the technological dimension that includes the inherent characteristics of the technology, versatility, and capabilities (Shih & Venkatesh, 2004). Similar to Norman (2011; 2013), the authors underlined that technology can be sophisticated without being difficult to use. As a general example, most washing machines are easier to use than they were 30 years ago and offer more functionality at the same time. According to the authors, the use of any technology must take into consideration the use of other technology in the home. It can be expected that complementary technologies “create synergetic effects” (Shih & Venkatesh, 2004, p. 62) and increase the level of use in related product category.

A third determinant is the personal dimension or the effect of personal variables on usage behaviour, which is a research area that has been investigated at length across various disciplines. To the authors, the determinant use innovativeness means that consumers are experimental and have an inclination to try different things. As such, “innovativeness has a direct link to variety of use” (Shih & Venkatesh, 2004, p. 62). The literature review indicated that some older adults display higher levels of use innovativeness than others (Joyce & Loe, 2010). A distinction is made by Joyce and Loe (2010) who defined that group of older adults as “technogenarians” and were described by Peine et al. (2014) as “innosumers” sharing similarities to von Hippel’s (2005) “lead users” based on their open and active utilization of new technologies. Complicated technology frustrates users (Norman, 2011; 2013), which often cause reactions

ranging from aggravation to disappointment (Shih & Venkatesh, 2004). As a result the product is used less frequently (rate of use) and is put to fewer uses than originally intended” (Shih & Venkatesh, 2004, p. 62). Fourth, external determinants may influence usage behaviours, such as a supportive social environment (Shih & Venkatesh, 2004). Similarly, use of technologies outside the home also influences the use of technology at home (as an example: a laptop which is used during work is also used at home for other purposes). In addition, they argued that media exposure might stimulate involvement with technology, which may account for higher levels of use.

### **UD outcomes**

The key assumption of the Use Diffusion model is that different usage patterns result in different levels of interest in future technology acquisition. An application of the model to older adults could help to understand different segment preferences regarding future technologies. Various scholars (Kohlbacher & Hang, 2011; Yu & Hang 2011) referred to the entrepreneurial golden opportunity by entering the ageing consumer segment, which is characterized as a price-sensitive growth market which at the same time demands adequate product performance (Yu & Hang 2011). Further, the model suggests that users who exhibit an intense usage pattern are more satisfied with the technology than users who exhibit limited use (Shih & Venkatesh, 2004). The degree of use also results in the impact of the technology on daily lives (Shih & Venkatesh, 2004). An intense use of a technology becomes part of a user’s life in that it modifies how the consumer operates on a daily basis. There is empirical support for this model from various disciplines (Joyce & Loe, 2010; Norman, 2011, 2013; Peine et al., 2014; Rogers, 2003; von Hippel, 2005) when it comes to identifying determinants and use patterns. However, for the purpose of the current study, several shortcomings need to be addressed. Applied to household technology use it seems intuitive that the outcome needs to be related to the successful accomplishment of domestic practices. The assumption that underpins this model is that the consumer market consists of a ‘socio-economic’ homogenous population of users. It is likely that not all older adults can afford a product equally well (Blythe et al., 2005). This aspect emphasize the important role that disruptive innovation can play, which favours more affordable products with less functional complexity.

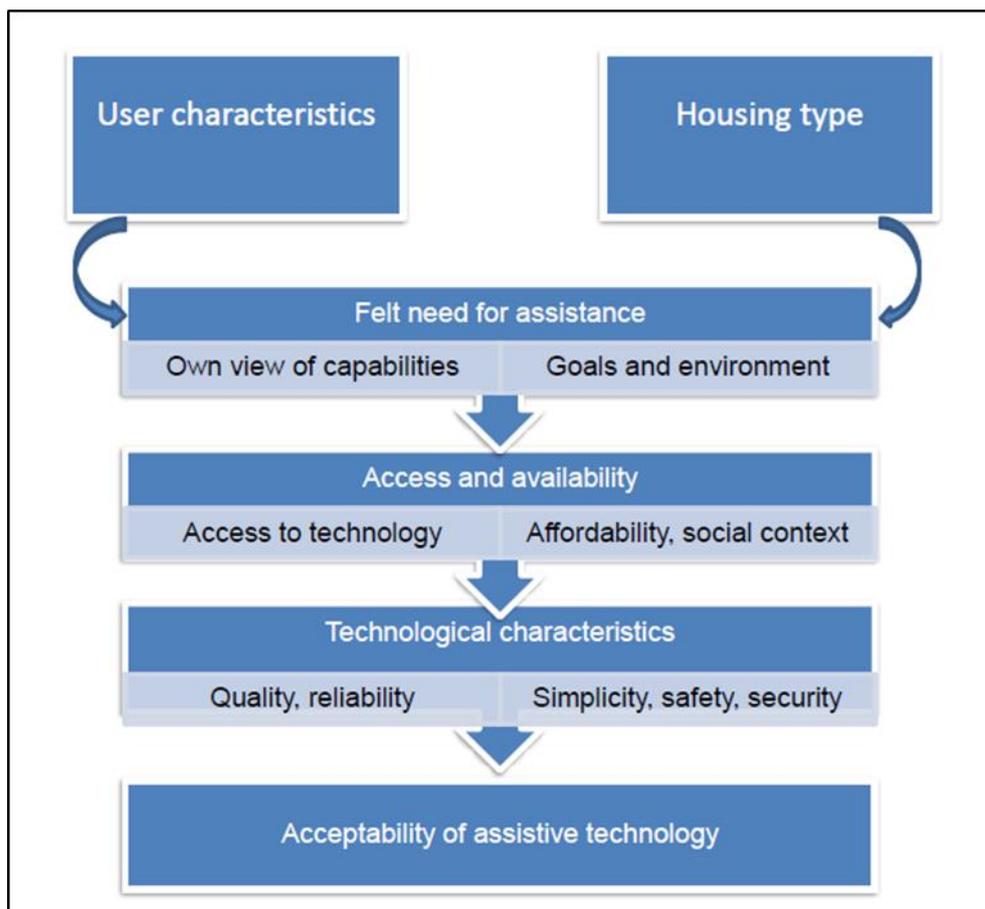
The model suggests that a person's ability to use a product successfully results in higher satisfaction (Shih & Venkatesh, 2004). As such, the model does not take into account age-related factors or psychological determinants like technical self-efficacy (Chen & Chan, 2011; Flandorfer, 2012), life changing events (Mathur et al., 2005), and the 'embodiment' (Lai et al., 2008) of domestic practices. To accomplish a high level of satisfaction with technology use requires a "diligent clarification" (Herstatt et al., 2011) of the target group and the special characteristics as pointed out by Levsen and Herstatt (2014):

Age-associated effects on the human body may appear at different ages and reach different degrees of severity; singular events may contrast with more steady effects, and dissimilar combinations of age-associated effects may impinge upon different individuals ... Therefore, any line of reasoning based on individual cases of elderly human beings is greatly impeded. (p. 6)

It is obvious, that managers need to be aware that the group of older adults is a highly diversified market with different capabilities and interest in future technologies. To sum up, the UD model is highly valuable because of its focus on different user typologies which helps to identify different interests and preferences in future technologies by older adults.

### **2.4.3 Technology acceptance among older adults**

Innovations and technologies developed particularly for the needs of older adults are referred to as gerontechnologies (Fozard & Wahl, 2012; Joyce & Loe, 2010). This field is a relatively new research area that mainly represents the interface between ageing and technology (Joyce & Loe, 2010). McCreddie and Tinker (2005) proposed a model (see figure below) that suggested that older adults' need for technological assistance is influenced by various individual and housing factors.

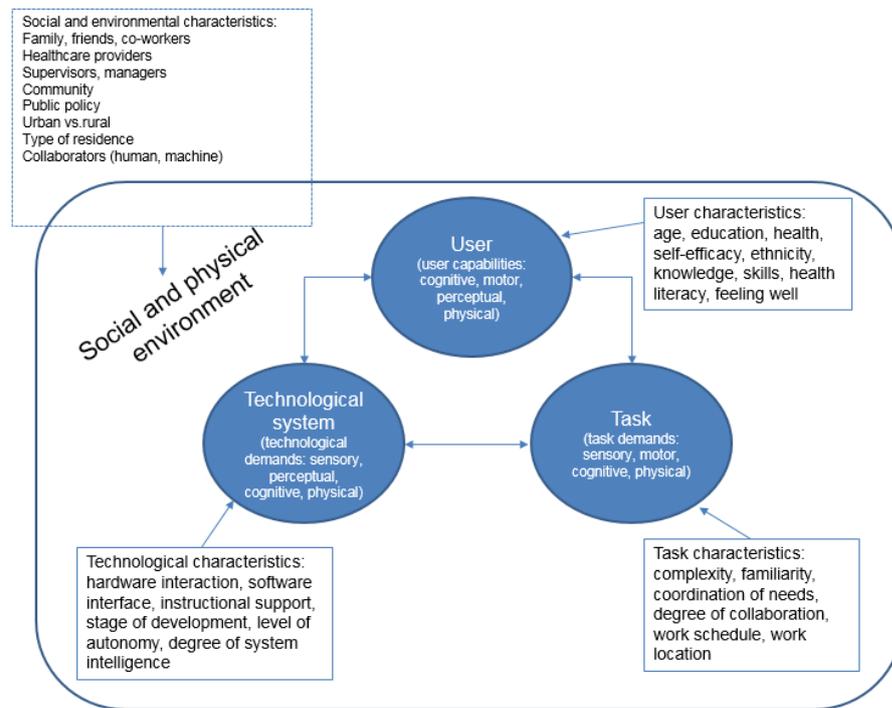


**Figure 14: Acceptability of assistive technology**  
(adapted from Lee, 2014; McCreddie & Tinker, 2005)

Based on in-depth interviews, the authors discovered that the acceptability of technology is determined by various technological characteristics, like reliability, simplicity, and affordability (Lee, 2014). The latter, affordability, seems to be a major innovation barrier and contradicts many high-tech strategies (Balasch et al., 2014; Ehrenhard et al., 2014; van Hoof et al., 2011), which aim to support ageing-in-place.

When it comes to understanding the influence of psychology on technology, this thesis owes a conceptual debt to work conducted by Fisk, Rogers, Charness, Czaja, and Sharit (2009) from “The Center for Research and Education on Ageing and Technology Enhancement” (CREATE). Rogers and Fisk (2010) stated that “psychology has much to offer to the design of technology - from understanding what people need, to identifying their preferences for design characteristics, and to defining their capabilities and limitations that will influence technology interactions” (p. 1). The adapted model (see figure below; original: Fisk et al., 2009), which was influenced by work of Lawton (1985),

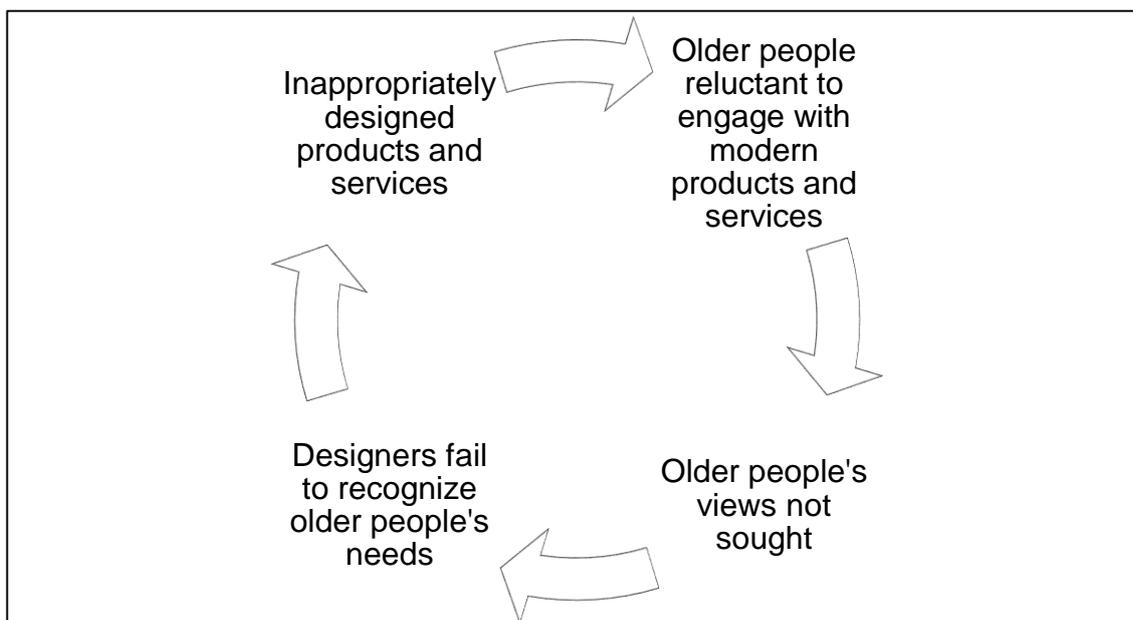
describes the possible determinants that influence the use of technology and embraces the characteristics of users, tasks and technological systems, and illustrates the interaction between those determinants (Lee, 2014). Further, the model incorporates the social and physical environment, which includes family and friends, healthcare providers, public policy, and other collaborators as important determinants that affect technology use (Lee, 2014).



**Figure 15: The CREATE model (adapted from Lee, 2014; Fisk et al., 2009)**

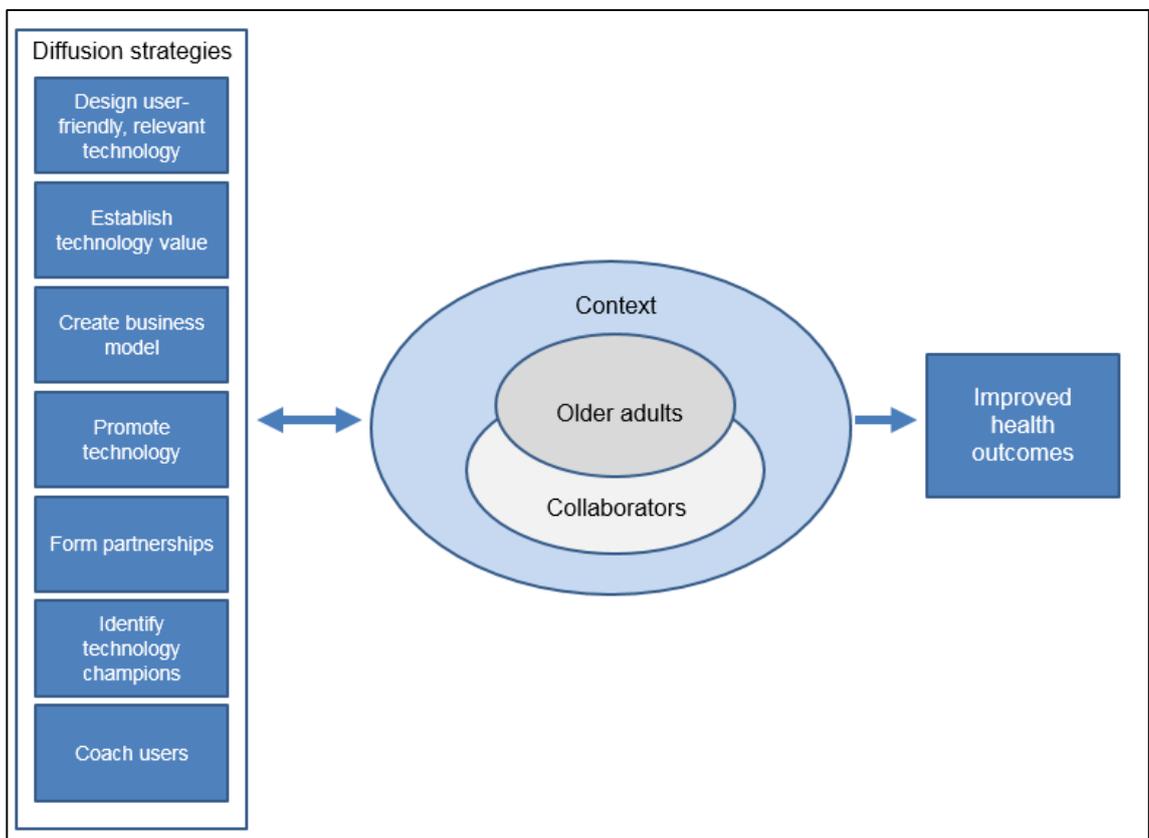
In contrast to the previous models, the CREATE model considers self-efficacy as a user characteristic. Bandura (1997), a psychologist, defined self-efficacy as one's belief in one's ability to succeed in specific situations. According to him, one's sense of self-efficacy can play a major role in how one approaches goals, tasks, and challenges. The construct was used in innovation studies and intended to describe general feelings toward the ability to adopt an innovation (Bagozzi & Lee, 1999). An extension of this concept is technical self-efficacy, which is the belief in one's ability to successfully perform a technologically sophisticated new task (Chen & Chan, 2011). It can be assumed that some older people express ambivalent feelings of acceptance and of detachment from technology (Chen & Chan, 2011). Often they are not sure how to benefit from technology because they consider themselves not competent enough (Chen & Chan, 2011; Czaja et al., 2006; Higgins & Glasgow, 2012; Mitzner et

al., 2010). In the literature (e.g., Chen & Chan, 2011; Mitzner et al., 2010), this construct typically refers to specific types of technology like computer self-efficacy or Internet self-efficacy. For this study, the author follows the definition of Bagozzi and Lee (1999) who defined self-efficacy “as the confidence one has that he or she can do what it takes to adopt an innovation” (p. 221). Furthermore, Rogers and Fisk (2010) underscored the high relevance of gathering user needs because “if technologies are to be successful in supporting memory needs of older adults, the technology must be designed with such specific needs in mind” (p. 4). In such reasoning, it seems that needs exist prior to the development of the new technology (Peine & Neven, 2011). However, it is frequently true that a newly available technology creates demands and needs (Norman, 2010). It appears that such general overreliance on user needs in academia has led to limited insights into technology adoption. More recent studies see older consumers as active collaborators and co-creators of new technologies (Flandorfer, 2012; Joyce & Loe, 2010; Loe, 2015; Peine & Neven, 2011). Those authors claimed that researchers have to seek encounters with older users and encourage their creative inputs in the development process. Thus, by involving elderly users in the research and design stage, their expressed needs are seen as inputs to specify the new technology (Peine & Neven, 2011). Wilkinson, Langdon, & Clarkson (2011) provided a cycle of design oversight (see below) influencing the uptake and engagement of technology by older people.



**Figure 16: Design cycle (Wilkinson et al., 2011)**

The ‘accelerating diffusion of proven technologies’ (ADOPT) model, which was developed by Wang, Redington, Steinmetz, and Lindeman (2011) provides a refinement to earlier models because it considers the context of use and integrates stakeholder perspectives (e.g., collaborators, caregivers, family members). The model describes various diffusion strategies related to technology diffusion and adoption in relation to these elements (Lee, 2014). The seven strategies that influence the adoption of health technology at home are: user friendliness, technology value, business model, promotion of technology, partnerships, technology champions, and user coaching. Those strategies help to facilitate the diffusion of health technologies used at home.



**Figure 17: The ADOPT model (adapted from Lee, 2014; Wang et al., 2011)**

The ADOPT model is one of the few technology acceptance models that considers marketing and business-related aspects, which is also the intention of the current thesis. Although, the ADOPT model provides an understanding of possible strategies to overcome acceptance barriers, it lacks an empirical foundation of primary data and a guideline for innovation and product management of how to develop a product.

Previous studies in this field discussed product categories such as walking frames and stair lifts (Levsen & Herstatt, 2014), social robots (Neven, 2014), and age-friendly mobile phones (Kohlbacher & Hang, 2011). The market potential of these various products categories has been explored using the disruptive innovation framework (Herstatt et al., 2011; Kohlbacher & Hang, 2011) with the aim to provide more affordable, easier to use products that enhance the autonomy or independence of older adults (Herstatt et al., 2011), which should lead to a triple-win situation for older adults, policymakers, and companies (Neven, 2010; 2011; Peine et al., 2015). However, the triple-win situation is disappointing (Kohlbacher & Hang, 2011; Peine et al., 2015; Sixsmith & Gutman, 2013). Part of the problem seems to come from the methodological shortcomings of case-based studies. The table below from Fozard and Wahl (2012) shows product examples in the field of gerontechnology, the four goals of technology (enhancement and satisfaction, prevention and engagement, compensation and assistance, and care support and organization) and the relevant life domains in which they are used.

Table 10: Goal of technology (Fozard & Wahl, 2012, p. 11)

		Goal of Technology							
		Enhancement Satisfaction		Prevention Engagement		Compensation Assistance		Care Support & Organization	
Time Period		1990s	2010+	1990s	2010+	1990s	2010+	1990s	2010+
Life Domain	Health & Self-esteem	Self-care	Custom Software	Home-trainer	Health monitoring	Active alarms	Medication reminder	Assistive gadgets	Telemedicine
	Housing & Daily Living	Remote control	Interactive control	Thermostat	Smart ventilation	No barrier movement	Cleaning robots	Remote controls	Electronic keys
	Mobility & Transport	Time-tables	Navigation tools	Handrails Sturdy grip	Automatic Controls	Rollator walker	Smart walker	Powered lifting	Video links
	Communication & Governance	Ticket fax machines	Multimedia connections	Noise control	Automatic messaging	Hearing aid	Cochlear implants	Vision aids	Text to speech
	Work & Leisure	Miniature camera	Digital cameras	Safety Equipment	Work simulation	Focused lighting	Virtual pets robots	Computer games	Interactive games

### **Life domain: Housing and daily living**

For this thesis, the domain housing and daily living is of primary relevance because the domestication of new technologies and context of use is often a neglected area in research (Demiris et al., 2004; Herstatt et al., 2011; Kohlbacher et al., 2014; Mitzner et al., 2010). This lacuna in research is rather surprising because it can be assumed that overcoming well-structured routines is a major barrier for implementation of new technologies (Bagozzi, 2007; Norman, 1999). Unfortunately, only a few studies have focused specifically on the context of technology use for older persons (Bailey & Sheehan, 2009; Jakobs et al., 2008; Loe, 2015). From the author's point of view, in order to overcome the resistance of technology domestication, it is required to understand the diversity of the living realities of the segment in more detail. It is consistent with and contributes to the influential work of Rogers and Fisk (2010), who found that the environment influences technology use. For this study, there is a general approach of studying independent living in a more defined area, the home. According to Oswald and Wahl (2005):

The home acquires new meaning in old age because it serves to compensate for the reduced functional capacity of the ageing individual, especially in very old age. To maintain autonomy and to avoid institutionalisation, either environmental changes or behavioural adaptations must generally occur. (p. 7)

Consequently, given that older people spend the majority of their time at home, it relates to the role household technology might play to facilitate independent living. Ageing-in-place describes the concept of the elderly continuing to reside in the family home. It represents the dominant single generational housing situation in the third age and well into the fourth age (Simpson, 2013; United Nations, 2013). Rowles and Ravdal (2002) related the importance of ageing-in-place to the "societal recognition of the role of ownership and attachment to place, and to the presumed need for the familiar, as adaptive features of ageing" (p. 90). To the authors, ageing-in-place was defined as staying in one's home even when age-or health-related changes make it difficult to care for oneself. Against this background, it becomes clearer why elderly prefer to stay with the familiar arrangements which makes behaviour change through new technologies harder.

Miller (2010) identified the home as a key area for research because what really matters to people usually happens in privacy. Although a number of disciplines have contributed to the understanding of the meaning of home (Massey, 2005; Miller, 2010; Pink, 2004, 2012; Shove et al., 2012), it has been mainly discussed in the area of environmental psychology and environmental gerontology (Oswald & Wahl, 2005). Surprisingly, it appears that innovation and technology studies have given too little research attention to the field of 'home.'

### **The goal of household technology**

To be able to organise everyday life (Mollenkopf et al., 2010) requires using everyday technologies such as domestic appliances (Higgins & Glasgow, 2012; Jakobs et al., 2008; Loe, 2015). "Self-reliance depends on their capacity to use domestic appliances such as washing machines ..." (Higgins & Glasgow, 2012, p. 333) and relates to domestic practices and practice theory, which offers a general orientation towards what people do (Nicolini, 2013; Warde, 2005). In this view, laundry practices involve more than simply washing and drying clothes (Shove et al., 2012). Those practices are part of people's everyday routines and depend on various influences external to the practice of doing laundry itself (Constanza et al., 2014). Edwards and Grinter (2001) argued that there are broad social implications of domestic technologies. An orientation is provided by Kaufmann (1998); he used the term injunctions to describe personal senses of obligation, senses of when washing simply has to be done. This sense of obligation seems to be a powerful force in structuring routine and practice and questions the liberal view of independent living and free choice. However, contemporary conventions which constrain behaviour and technology use are not always so readily identifiable. Some historical studies challenged the belief that technologies are labour saving devices (Cowan, 1983; Shehan & Moras, 2006). In line with Kaufmann (1998), Edwards and Grinter (2001) indicated the influence of conventions in doing the laundry and using the washing machine: "Over time, these devices changed society's expectations about what things would be done, how often and by whom" (p. 264). An issue of primary importance in understanding technology use by older adults is to recognize that it is a 'stigmatised-identity' and because of this, being old is a label that many will try to avoid (Day & Hitchings, 2011; Twigg, 2014). Doing the laundry relates to fashion and dressing because "standards must be kept high:

ties unstained, buttons firmly sewn on, hemlines straight, so that one's functionality is unequivocal" (Day & Hitchings, 2011, p. 889).

During the formative period (van de Goor & Becker, 2000; Sackmann & Weymann, 1994), which is estimated to be between 10 and 25 years old, people acquire values, norms, attitudes, behaviours, and skills. Those attributes usually stay with an individual for a long time and influence future behaviour; however, they might be changed or reinforced later in life by societal change (van de Goor & Becker, 2000). People who used or experienced certain technologies during their formative period may also exhibit similar usage behaviour in later years (Sackmann & Weymann, 1994). Sackmann and Weymann (1994) recognized this group of people as a 'technology generation' and the authors proposed that different technology generations behave differently with technology, displaying a generation effect due to the way they learned to interact with and used technology during their formative period. Thus, they provide a split of four technological generations:

- Early technological generation: born before 1939
- Generation of household revolution: born 1939 – 1948
- Society of increasing technology in the household: born 1949 -1963
- Computer generation born 1964-1978

For this study, two technological generations are relevant: the early technological generation and the generation of household revolution (Sackman & Weymann, 1994). Persons who belong to the early technological generation experienced the Second World War and desolate living circumstances. The household context was rather minimalist in relation to technological support and most of the household tasks were labour intensive. The diffusion of electrical power as well as the radio can be seen as important technological developments in the formative period. This generation was characterized by the traditional role of the women as responsible for doing the housework (Cowan, 1983). The generation of the household revolution experienced its formative period after the war; household appliances like vacuum cleaners and washing machines were introduced making household tasks much easier to accomplish.

In summary, while studies in the realm of gerontechnologies focus on specific assistive technologies to support older adults in their daily lives, this thesis

## 2 LITERATURE REVIEW

explores everyday technologies (Jakobs et al., 2008; Loe, 2015) as instruments to facilitate ageing-in-place, and in that respect broadens the scope of gerontechnologies (Loe, 2015). The following table (adapted from Claudy et al., 2015) illustrates some of the adoption and resistance factors discussed.

**Table 11: Innovation adoption and resistance factors (adapted from Claudy et al., 2015)**

<i>Adoption factors</i>	<i>Definition</i>	<i>Resistance factors</i>	<i>Definition</i>
Relative advantage (Rogers, 2003)	Innovation is perceived as being better	Usage barriers (Ram & Sheth, 1989)	Innovation requires changes in workflows and routines (Laukkanen et al., 2007)
Compatibility (Rogers, 2003)	Innovation is perceived as consistent with existing values, past experiences, life-styles	Value barriers (Ram & Sheth, 1989)	Innovations' performance-to-price ratio is evaluated in relation to its substitutes (Laukkanen et al., 2007)
Complexity (Rogers, 2003)	Innovation is perceived as relatively difficult to understand and use	Risk barriers (Ram & Sheth, 1989)	Risks which consumers encounter or perceive in innovations (Laukkanen et al., 2007) e.g., related to financial, functional and social consequences
Trialability (Rogers, 2003)	Innovation may be experimented with on a limited basis	Tradition and norm barriers (Ram & Sheth, 1989)	Innovation forces consumers to accept changes in family and social values (Laukkanen et al., 2007)
Observability (Rogers, 2003)	The result of an innovation is visible to others	Image barriers (Ram & Sheth, 1989)	Innovation is perceived as having an unfavourable image (e.g., perceived quality), e.g., from their origin (Laukkanen et al., 2007)
Perceived usefulness (Davis, 1989)	Using a system would enhance job performance	Life course / life-changing events (Mathur et al., 2005)	When individuals experience certain life events, they experience stress (Mathur et al., 2005). Certain events (e.g., widowhood) can cause changes in usage and consumption habits (Mathur et al., 2005)
Perceived ease of use (Davis, 1989)	Using a particular system would be free from effort	Technical self-efficacy (Bandura, 1997; Chen & Chan, 2011)	One's belief in one's ability to succeed with a technological task.
Job-to-be-done (Christensen & Raynor, 2003)	The innovation helps customers to accomplish more effectively and conveniently what they are trying to do	Chasm (Moore, 2002)	Marketing strategies to reach the early adopters do not meet the demands of the mainstream markets.

### **2.4.4 Theories and models of social practice**

Sociologists of technology argued that an application of concepts given by theories of practices could offer an alternative understanding of technology adoption (Dourish, 2006; Feldmann & Orlikowski, 2011), behaviour change (Hargreaves, 2011), and consumption patterns (Halkier, Katz-Gerro, & Martens, 2011; Shove et al., 2012; Warde, 2005). Compared to the previously discussed theories, it provides a new way of thinking about behaviour as practice (Spotswood, Chatterton, Tapp, & Williams, 2015). A main difference between theories of practice and technology acceptance models can be found by analysing the theories' different objects of analysis (Spotswood et al., 2015). For instance, Bagozzi (2007) mentioned, "TAM is conceived largely as framework for explaining decision making by individual persons" (p. 247). Scholars in the field of sociology (Hargreaves, 2011; Shove et al., 2012; Spotswood et al., 2015; Warde, 2005) have largely rejected purely individualistic, 'attitude' driven decision making approaches because they neglect "tacit and unconscious forms of knowledge and experience" (Shove et al., 2012, p. 12). To Halkier et al. (2011), "Practice theories are a set of cultural and philosophical accounts that focus on the conditions surrounding the practical carrying out of social life" (p.3). Diffusion and technology acceptance models evaluate the innovation adoption on product attributes (Christensen & Raynor 2003; Heidenreich & Spieth, 2013; Ram & Sheth, 1989; Rogers, 2003; Venkatesh et al., 2003). In practice-oriented theoretical approaches, "consumption occurs as items are appropriated in the course of engaging in particular practices" (Warde, 2005, p. 131). While diffusion and technology acceptance models focus on the individual and product attributes, this perspective provides an orientation toward the bodily doings and sayings (Nicolini, 2013; Schatzki et al., 2001). It shifts the unit of analysis to practices, what people do, rather than the individual. The concepts of disruptive innovation and practice theory have the 'doing' in common: the concern is the job to be done (Anthony et al., 2008; Christensen et al., 2009; Raynor & Christensen, 2011); or from a social practice theory view, the practice (Reckwitz, 2002; Schatzki et al., 2001; Shove & Pantzar, 2005; Shove et al., 2012; Warde, 2005) is the focal point of interest. While this might look like a fruitful integration, some social theory scholars (Reckwitz, 2002; Shove, 2009) would argue that these contrasting paradigms are incompatible.

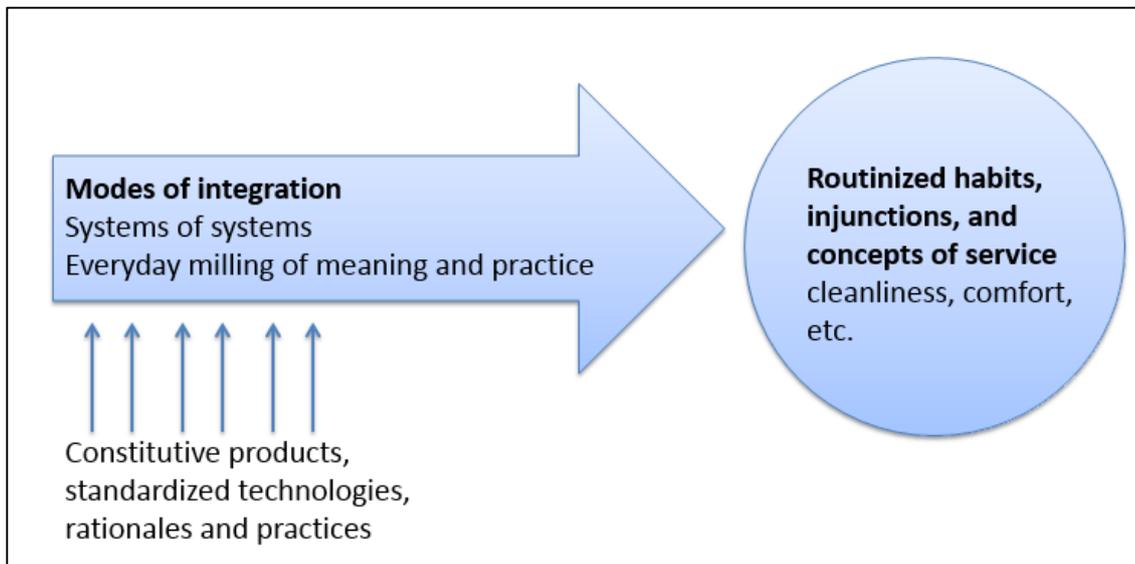
In such thinking, mergers of social theories of practice and social theories of behaviour are doomed to failure (Shove, 2009) because social theories of practice are not behavioural (Shove, 2009). To explore the domestic practices of older adults, it is necessary to be aware that practices represent a particular way of understanding social life. To Reckwitz (2002):

A 'practice' (Praktik) is a routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. (p. 249)

In the current study, the author follows a less strict interpretation and treats the concept of practice as helping to focus the attention on the accomplishment of the 'doing.' Sociologists of technology made clear that the domains of both technology and everyday practices are mutually constitutive (Dourish, 2006). Doing the laundry has been defined as the focal practice for this study because it is already established in sociological work as an analytical tool (Kaufmann, 1998; Pink, 2012; Shove et al., 2012). The sociologist Kaufmann (1998) examined the relationships of couples using laundry as 'the tool' to stimulate narratives. Other scholars (Gram-Hanssen, 2011; Shove, 2003) studied energy consumption or explored the "sensory home" (Pink, 2012). This research will build on and contribute to these works. This study shows that talking about doing the laundry and the washing machine is especially significant because those practices have a 'Trojan horse' like ability (Shove, 2003) to identify innovation barriers from which to suggest strategies to overcome those barriers. In other words, through understanding the discourses and rationales of laundering, the research aims to support ageing-in-place.

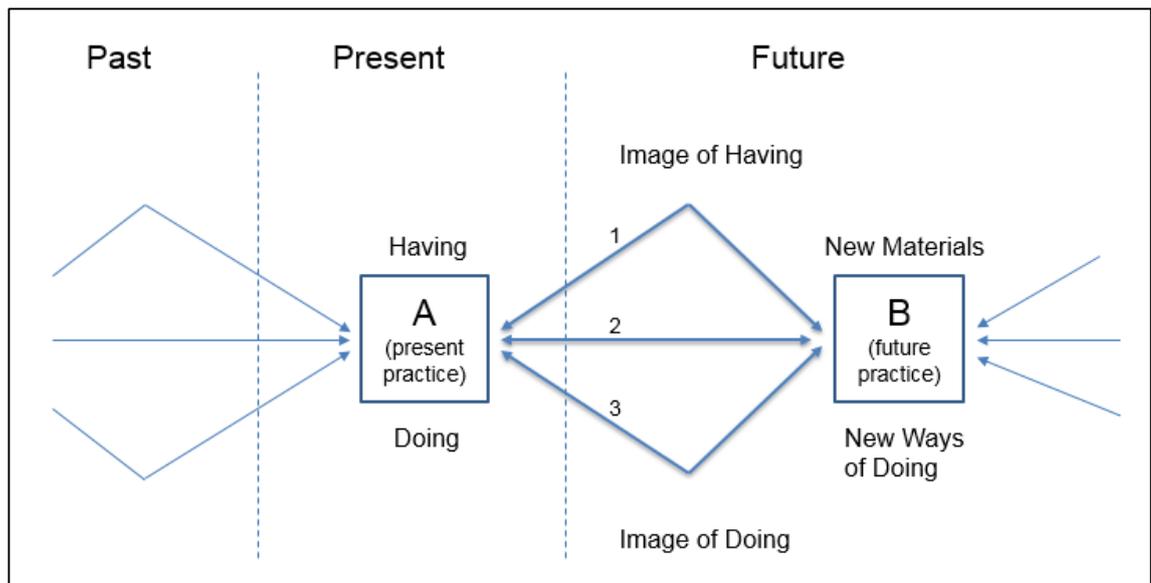
Sociologists of technology have focused especially on how technological innovations affect social transitions (Pink, 2012; Shove et al., 2007; Spotswood et al., 2015; Verganti, 2009). As an example, the improvements in the washing machine and the advertising efforts by the detergent industry have changed the perception of what cleanliness means to those who do the laundry (Pink, 2012; Shove, 2003). Further attention has been given to the constraining effects of existing sociotechnical systems on the adoption of innovation (Shove, 2003). The figure below describes the complex interplay between products, practices,

and technologies. It illustrates the means and modes of their adoption, and the routines, obligations, and senses of normality that emerge as a result (Shove, 2003).



**Figure 18: Modes of integration (Shove, 2003, p. 409)**

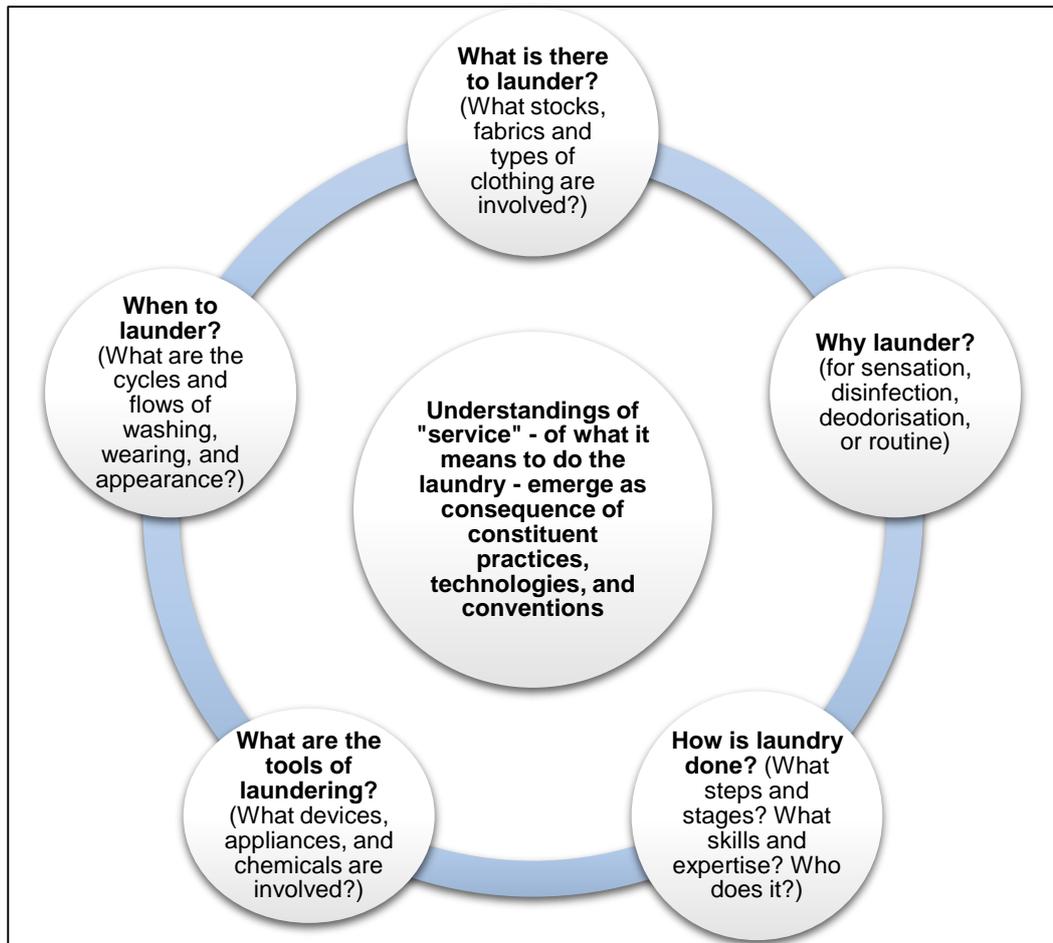
The large arrow makes reference to two types of integration: that which people do as they follow everyday task and that which is created or designed in sociotechnical systems of laundering (Shove, 2003). The model raises further questions about how standardized technologies are incorporated into practices and into already existing sociotechnical systems (Shove, 2003). The model provides an understanding of the concept that standardized, technical objects define the framework of user action (Akrich, 1992) and restrict users in technology use. However, it does not relate technology to the capabilities of older adults. Shove et al. (2007) provided a model that emphasizes the relationship between the having of things and the doing of practices. In the model below the 'A' means that a "current practice is organized by existing materials (kitchens, washing machines, etc.) and by prior modes of doing, forms of know-how, traditions, skills etc. 'B' represents future practice – this is the conjunction of future materials and future modes of doing" (Shove et al., 2007, p. 36). This dynamic model provides three routes by which persons might move from 'A' to 'B':



**Figure 19: The dynamic model of having and doing (Shove et al., 2007, p. 14)**

According to the authors, route one shows the path in which achieving 'B', or realising the future image of doing demands the acquisition of new materials. To them, in route two 'A' and 'B' are pretty much the same. The route three describes the path in which achieving 'B' does not require the acquisition of any more materials (appliances, kitchens etc.) but involves making different use of what already exists, or doing things differently (Shove et al., 2007). As visualized in the model, modifications in daily practices and consumption are embedded in the past, present and future. As such, a kind of "provisional equilibrium" (Shove et al., 2007, p. 141) arises in different ways, through an adoption of the having (e.g., things, objects, stuff) or the adoption of the doing, or because both are in any case stable (Shove et al., 2007). Like current practices ('A'), future practices ('B') are also shaped both by the past and by expectations of the future (Shove et al., 2007). In emphasizing the relation between having and doing, the model suggests that consumption is organized in terms of past, present, and future practice. "At least in the kitchen, things are acquired, discarded and redesigned with reference to culturally and temporally specific expectations of doing and of having – not of having alone" (Shove et al., 2007, p. 37). As such, as a guideline for innovation and product management, the dynamic model is valuable for understanding that older people buy things because they 'need' them to accomplish valued social practices (Shove et al., 2007). Suopajärvi (2014) supported Shove's view that future expectations matter. To the author, the proximity of death means that some older adults do

not want to purchase expensive appliances (Suopajarvi, 2014). However, the model does not consider that consumption and usage patterns are dynamic rather than static (Shih, Venkatesh, Chen, & Kruse, 2013). It can be assumed that certain life events lead to role transitions (e. g., widowhood) and require adjustment of life-styles and usage patterns (Mathur et al., 2005). In addition, the model does not relate technology to the capabilities of older adults. As such, it neglects the physical burden or the embodiment of consumers (Lai et al., 2008). Against this background, “technology offers a challenge and an opportunity in providing support and in enhancing the daily lives of older people” (Chen & Chan, 2011, p. 9). Giving consideration to capabilities is a fundamental concern because “designing appliances to extend cognitive abilities provides opportunities to prolong functional independence” (Higgins & Glasgow, 2012, p. 333). For a more detailed analysis of a practice, the view that practices can be deconstructed into “several elements, interconnected to one another” (Reckwitz, 2002, p. 249) seems to be more helpful. As such, the author has to make explicit the interrelation of skills, objects, and images because “the fundamental thing here is that it is the integration of the elements of practice which (for a time) sustain a given order” (Shove et al., 2007, p. 148). With ageing, age-related declines occur over the lifespan, which makes links weaker and might even break them at a certain point in a lifetime. A poor health situation might break or disrupt links to performing a domestic task. This necessitates research into developing technology to sustain domestic practices during cognitive and physical decline (Higgins & Glasgow, 2012). “Developing new appliance technologies that compensate for declining abilities may be a means of self-sufficiency, thereby delaying admittance to residential care” (Higgins & Glasgow, 2012, p. 333). For innovation management, this research suggests that managers and designers need to “look for work-arounds” (Brown & Wyatt, 2010, p.32) in daily practices and understand the ‘ecosystem’ of things, which requires consideration of the entire complex of interrelated elements (including competence, meaning) of which practices are made (Shove, 2003). The figure below shows the arrangements of elements required for doing the laundry, each of which are driven by their own dynamic (Shove, 2003). However, only when those elements are brought together do they constitute the system of doing the laundry as a whole or as Shove (2003) termed it ‘service.’



**Figure 20: Wash cycle (adapted from Shove, 2003)**

Shove (2003) related skills and technology to an assembly of cogs. Together they constitute the system as a whole in which certain cogs or components act as conduits for change (Shove, 2003). As Figure 21 indicates, "some cogs are likely to be more dominant than others" (Shove, 2003, p.405). As an example, the reliance on the domestic washing machine is, for instance, now so great that anything to emerge from that appliance is by definition, clean (Shove, 2003). The framework (Figure 21) highlights the context of use, the physical burden or the embodiment of consumers (Lai et al., 2008), which is particularly important for studying older adults' use of household technologies that are embedded in domestic practices.

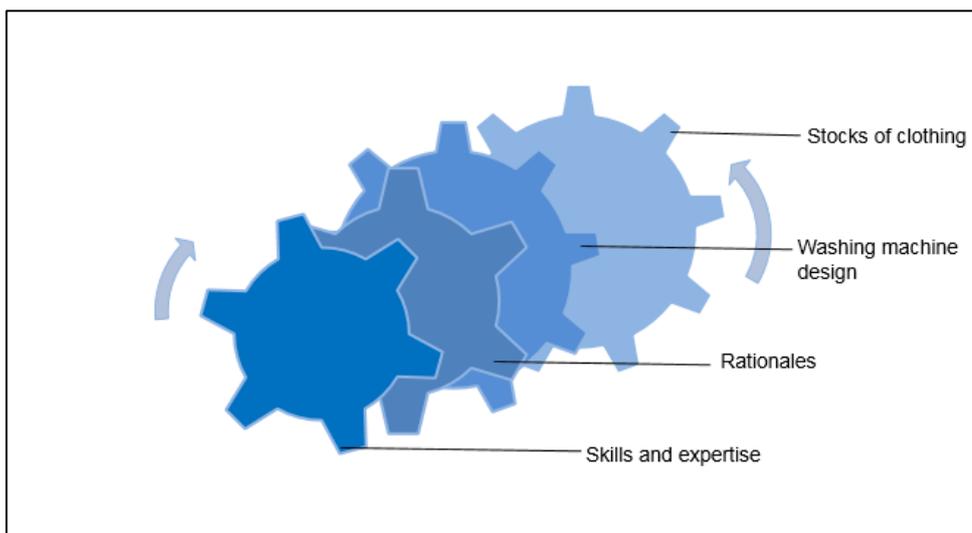


Figure 21: Cogs in a system of systems (Shove, 2003, p. 405)

Sociologists observed that ‘elements’ of a practice are not static (Reckwitz, 2002; Schatzki, 2001; Shove, 2003). They are defined and constituted in relation to each other and are constantly changed (Shove, 2003). Reckwitz (2002) suggested that social practices depend on the active integration of elements. In *The Dynamics of Social Practice*, sociologists (Shove et al., 2012) focussed on just three key elements: materials, meanings, and competences (see figure below). According to the authors, where a practice is regularly reproduced, these three constitutive elements are regularly combined.

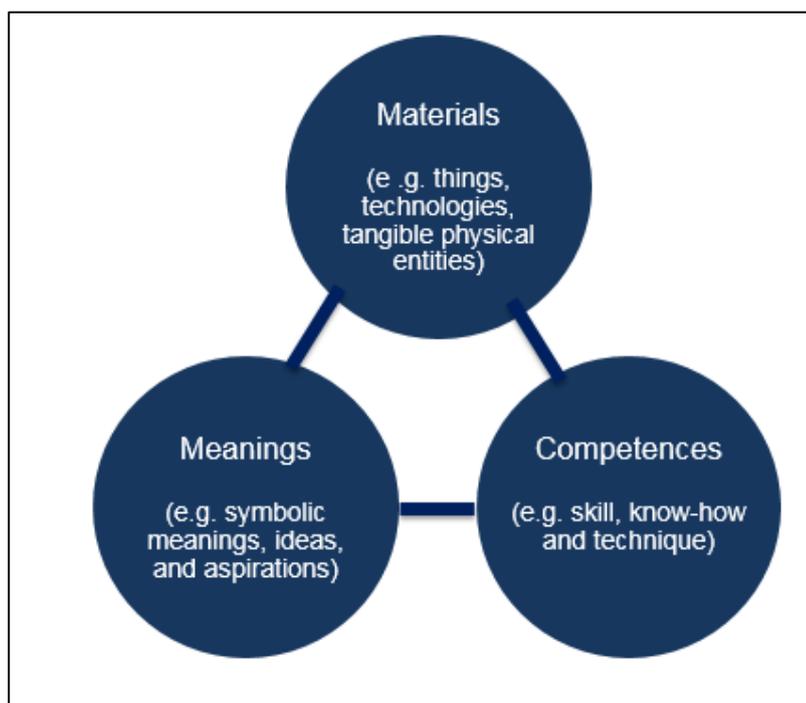


Figure 22: Three-element framework of social practices (Shove et al., 2012, p. 14)

This three-element framework has been applied in several studies related to consumption and design (Halkier et al., 2011; Hargreaves, 2011; Kuijer & De Jong, 2011). To direct innovation and product management to these three elements provides a more holistic approach for product managers and designers because “it would make sense to suggest that designers are involved in shaping not just material elements, which have no role in isolation, but the entire complex of elements (including competence, meaning) of which practices are made” (Shove, 2014, p. 42). In other words, practices consist of interrelated elements that can be influenced by managers and designers, for the better or for the worse.

In this thesis, the author adapts Shove et al.’s (2012) helpful understanding of practices as three interrelated elements containing images (meanings), skills (competences), and objects (stuff, materials, technologies).

- *Images* (or meanings) are elements that give meaning to the practice or the reasons for doing (Shove, 2003; Shove & Pantzar, 2005; Shove et al., 2012). They are socially shared within a group like the elderly and often implicit. This element has a particular role in this thesis because the authors sees the accomplishment of a practice as a prerequisite for independent living. Doing domestic chores offers continuity over the course of a day and a life. The ability to organise everyday life (Mollenkopf et al., 2010) requires using everyday technologies such as domestic appliances (Higgins & Glasgow, 2012; Jakobs et al., 2008; Loe, 2015), which relates to objects.
- *Objects* (or materials) represent the group of material elements, things, and human bodies (Shove, 2003; Shove & Pantzar, 2005; Shove et al., 2012). In this thesis, the term objects is preferred to emphasize that “mundane everyday devices are important playing fields of active ageing” (Loe, 2015, p. 5). This is related to what Shove et al. (2012) defined as competences or skills. Not to be capable to do the laundry can have unpleasant effects, as doing the laundry is related to getting dressed. However, depending on others to do the laundry can be very humiliating.
- *Skills* (or competences) are learned bodily and mental routines, know-how, and levels of competence (Shove, 2003; Shove & Pantzar, 2005; Shove et al., 2012). Rapidly developing technological functionalities and

the competences of older persons might result in a gap. This is termed “individual lag” by gerontologists (Lawton, 1998; Peine & Neven, 2011). “Technological change may outpace the capacities of older persons, thus leading to over-demand” (Peine & Neven, 2011, p. 129), which supports the application of disruptive innovations as an alternative innovation strategy.

As such, using the Shove’s three-element framework fosters interdisciplinary thinking (Spotswood et al., 2015) in product and innovation management because products in isolation do not have a value (Shove & Pantzar, 2005). Individuals are “the crossing points” (Reckwitz, 2002, p. 256) of a range of practices, which are linked with one another. Past studies have recognized how closely related doing the laundry is to dressing (Kaufmann, 1998; Pink, 2004; Shove et al., 2012). “Any change in the links between elements of either practice is likely to affect the other” (Spotswood et al., 2015, p. 30). In this research, the author will adapt Shove’s three-element framework and use it as an assembly of cogs that constitute the system of doing the laundry as a whole (Shove, 2003; Shove et al., 2012). The author highlights the element ‘image’ to underline that doing the laundry is related to the practice of dressing and a prerequisite for independent living. Therefore, the three-element framework is integrated in the initial research model and used throughout the research to capture the arrangement of elements.

The prior review offers a critical evaluation of separate theories and models from different disciplines. The evaluation tables on the following pages provide a synopsis of the theories and models with their strengths and weaknesses.

Table 12: Review of relevant theories, models, and frameworks

Theory/model/framework	Description	Typology of population	Relevant criteria and key constructs	Relevance and limitations for thesis	
				Pros	Cons
<b>Use-Diffusion model (UD) (Shih &amp; Venkatesh, 2004)</b>	The model focuses on post-adoption (technology is already in use) and combines two constructs, variety of use and rate of use, to yield four user segments. Use patterns occupy a special place in the model. The key assumption of this model is that different user segments have different levels of interest in future technology acquisition.	The fourfold user typology compares usage of different individuals and consists of intense users, specialized users, non-specialized users, and limited users. Intense users represent the highest level in terms of use innovativeness and are linked by Venkatesh et al. (2004) to the characteristics of lead users (von Hippel, 2005).	User typologies vary on the basis of social context (household communication, competition for limited resources, prior experience with technology in the family), technological dimensions (technological sophistication, complementary technologies), as well as personal dimension (use innovativeness, frustration with technology), and external influences (external communication, external technology access, family exposure to target media).	The model underscores the relevance of segmenting the market. The fourfold user typology is a way to visualize different user segments. As such, the model functions as a relevant starting point for exploring opportunities in an elderly customer segment, which is highly diversified regarding technology use.	The model was applied to computer use, which is a different field of application than that of domestic appliances, because the already-in-place arrangements (Gomez, 2015) and the location might influence usage patterns (Shove, 2003). It examines usage patterns at a point in time. However, use patterns might change over a period of time (Shih et al., 2013). The user typology profile is too abstract and requires enrichment through sociodemographic descriptions (see Rogers, 2003).
<b>Technology acceptance model (TAM) (Davis, 1989; Davis et al., 1989)</b>	TAM is understood as a framework to explain decision making by individual persons (Bagozzi, 2007). TAM was created to predict information technology acceptance (Davis, 1989; Venkatesh et al., 2003).	TAM has been widely applied to different user groups mainly in the domain of communication and assistive technologies (Chen & Chan, 2011; Venkatesh et al., 2003) TAM and most TAM-related studies of technology and its use were directed to young adults; older adults were neglected (Chen & Chan, 2011).	The model focuses on attitudes for behaviour change. The two most important attitudinal factors for explaining acceptance and usage are perceived usefulness and perceived ease of use.	Main strength is its simplicity (Bagozzi, 2007). Numerous empirical studies have confirmed that it is a robust model for explaining acceptance behaviour across subjects and different kinds of technologies and products (Chen & Chan, 2011; Jakobs et al., 2008; Mitzner et al., 2010).	The model does not focus on objectives or goals of technology use (Bagozzi, 2007). It contains deterministic processes (Bagozzi, 2007) and neglects that the attitude toward using a technical device might change over time (Peine & Neven, 2011). It neglects the context of use, the physical burden or the embodiment of consumers (Lai et al., 2008). Biophysical (e. g., cognitive decline) and psychosocial (e. g., social isolation) characteristics of (older) users are not included (Chen & Chan, 2011).

Theory/model/ framework	Description	Typology of population	Relevant criteria and key constructs	Relevance and limitations for thesis	
				Pros	Cons
<b>Unified theory of acceptance and use of technology (UTAT) (Venkatesh et al., 2003)</b>	The model is a comprehensive synthesis of prior technology acceptance research. UTAT incorporates direct determinants of usage intention and incorporates moderators. The model was originally developed in an organizational use setting, not a consumer use setting.	The longitudinal field studies were conducted at four organizations among individuals being introduced to a new technology in the workplace. The model was tested in the workplace and does not consider older adults in their context of use.	“UTAT and related models hinge on intentionality as a key underlying mechanisms that drives behaviour.” (Venkatesh et al., 2012, p.161). Performance expectancy, effort expectancy, and social influence affect behavioural intention to use a technology, while behavioural intentions and facilitating conditions determine technology use. Age, gender, experience, and voluntariness moderate various UTAT relationships. The construct of performance expectancy is the strongest predictor of behavioural intention (Venkatesh et al., 2003; Venkatesh et al., 2012)	The model includes ‘age’ as mediating factor. However, the mediating factor ‘age’ is measured by chronological age which is criticized by various scholars as a weak predictor (Joyce & Loe, 2010; Mitzner et al., 2010; Peine & Neven, 2011)	Bagozzi (2007) regards UTAT as a patchwork of unrelated models. UTAT neglects context habit and cost/ price of technology use. “Context habit has been shown to be a critical factor of technology use” (Venkatesh et al., 2012, p. 161). The mediator ‘chronological age’ cannot differentiate people who are different in physical functions or psychological performance (Chen & Chan, 2011). The model does not provide a differentiation of user types.
<b>The dynamic model of customer usage of services (Bolton &amp; Lemon, 1999)</b>	The model links customers’ prior usage levels, satisfaction evaluations, and subsequent service usage. The authors introduce the construct of payment equity to explain how customers’ satisfaction evaluations and service usage levels vary over time.	The model suggests a provider-customer relationship that includes a payment plan. The model makes no specific relation to older costumers.	Payment equity is the customers’ perception of the fairness of a payment for service usage. The model proposes that customers make evaluations about payment equity by comparing their current payment and usage levels with normative (“should”) expectations.	The key construct of the model helps in understanding how the actual usage levels differ depending on the services’ price structure. It might offer valuable insights for marketing managers concerned with pricing strategies of services and new business concepts in the sharing economy.	The model was tested only on services. As such, it may not work as well on other categories like consumer durables. The model does not provide a differentiation of user types.  The model assumes a homogenous market neglecting different market segments and income levels. As such, the usage level of services might vary within the group of older adults.

Theory/model/ framework	Description	Typology of population	Relevant criteria and key constructs	Relevance and limitations for thesis	
				Pros	Cons
<b>A framework for modes of integration (Shove, 2003)</b>	The framework describes the complex relationship between products, practices, and technologies. It considers the modes of their integration, and the routines, habits, and obligations that emerge as a consequence (Shove, 2003).	The model shifts the attention from the individual to a practice orientation. It does not make a specific reference to older adults' capabilities or skills.	The model shifts the attention from the individual to a practice orientation. The model makes reference to two types of integration: that which people do in their daily activities and that which is in some sense designed into sociotechnical systems (Shove, 2003). The model emphasizes the constraining effects of existing technologies.	The framework raises further questions about how standardized technologies are incorporated into practices and into already existing sociotechnical systems (Shove, 2003).	The model does not relate technology to the skills and capabilities of older adults.  The model is too abstract to analyse domestic practices and does not relate to business interests. It has an unclear empirical basis.
<b>The dynamic model of having and doing (Shove et al., 2007)</b>	The model emphasizes the relationship between the having of things and the doing of practices. In emphasizing the relation between having and doing, the model suggests that consumption is organized in terms of past, present and future practice.	The model shifts the attention from the individual to a practice orientation. It does not make a specific reference to older adults.	The model shows how modifications in daily practices and consumption are embedded in the past, present and future. As such, a kind of "provisional equilibrium" (Shove et al., 2007, p. 141) arises in different ways, through an adoption of the having (e. g. things, objects, stuff) or the adoption of the doing, or because both are stable.	The model emphasizes the relation of having and doing. It departs from a static view of consumption patterns. The model helps to understand that people buy things because they 'need' them to accomplish valued social practices (Shove et al., 2007). Patterns of consumption are related to the past, present, and future (Shove et al., 2007).	The dynamic model deals with the elements of social practices as separate entities. The model is too abstract to analyse domestic practices. It does not relate technology to the skills and capabilities of older adults. It neglects the physical burden or the embodiment of consumers (Lai et al., 2008).
<b>The three-element framework of social theories of practice (Shove et al., 2012)</b>	The framework is built on the assumption that practices can be deconstructed into "several elements, interconnected to one another" (Reckwitz, 2002, p. 249). The framework helps to understand practices as consisting of three interrelated elements: images or meanings, skills or competences, and materials or objects that are integrated by practitioners through routine performance.	The model shifts the attention from the individual to a practice orientation. Implicitly the approach assumes that "consumption occurs as items are appropriated in the course of engaging in particular practices" (Warde, 2005, p. 131). The model does not make a specific reference to older adults.	Practices consist of three interrelated elements: materials, meanings, and competences. Shove (2014) suggests "that designers are involved in shaping not just material elements, which have no role in isolation, but the entire complex of elements (including competence, meaning) of which practices are made" (p. 42).	Framework provides a holistic approach for innovation management because the entire complex of elements are involved. It helps to simplify the abstract nature of practice theory (Spotswood et al., 2015). It considers the physical burden or the embodiment of consumers (Lai et al., 2008).	The framework is not established as an applied set of tools in managing behaviour change (Spotswood et al., 2015) and is rather new in the field of innovation management (Shove & Pantzar, 2005). Model does not relate to commercial aspects. It does not emphasize that certain elements ('cogs') of a practice might be more important than others.

## 2 LITERATURE REVIEW

Theory/model/ framework	Description	Typology of population	Relevant criteria and key constructs	Relevance and limitations for thesis	
				Pros	Cons
<b>Diffusion of innovation (DOI) (Rogers, 2003)</b>	The theory states that a typology of adopters exists along the diffusion curve. The model explains the process by which an innovation reaches a critical mass of adopters. It assumes that the underlying behaviour driving the process is communication across consumers. The model focuses on acquisition of objects rather than of use.	To develop a market is to focus first on innovators, growing that market, proceeding to the late majority and even laggards (Moore, 2002). The underlying assumption is that all innovations are always perceived as improvements and should be adopted by everyone, including older adults. Rogers (2003) makes no distinction of age: "Earlier adopters are no different from later adopters in age" (p. 288).	Individuals adopt new products at different times and different rates. The innovation decision process is the process through which an individual passes from the first knowledge of an innovation (1), to forming an attitude toward the innovation (2), to a decision to adopt or reject (3), to implementation of the new idea (4), and finally to confirmation of this decision (5). Rogers highlights the following characteristics that need to be considered for the adoption of an innovation: relative advantage, compatibility, complexity, trialability, observability.	The model underscores the relevance of segmenting the market. It describes different characteristics of adopter segments. Therefore, it assists managers to adjust their marketing strategies (Tellies, 2006). The model is applicable to a broad range of product categories.	Several scholars (Moore, 2002; Slater & Mohr, 2006) have questioned a continuous progression over the life of a product and identified a "chasm" (Moore, 2002). It appears that market diffusion is not only driven by communication (Goffin & Mitchell, 2010; Golder & Tellies, 1998). The model assumes that the product does not change over time. This seems to be unrealistic in a competitive market environment. Adoption does not guarantee that the product is used in a meaningful way (Shih et al., 2013).
<b>Disruptive innovation (Christensen, 1997)</b>	Disruptive technologies prosper in low-end segments or in new markets and later on invade the mainstream market. They can broadly be defined as products that initially perform worse than established products (Christensen, 1997, 2013; Raynor & Christensen, 2011). Over time, further developments improve the performance on the attributes mainstream customers value, to a level where the new technology begins to cannibalize the existing technology.	The concept addresses over-served consumers in the low end of the mainstream market. It attracts consumers for whom the market leader's offering has excess functionality and is unaffordable (Hang et al., 2014).  Scholars (Kohlbacher & Herstatt, 2011) referred to disruptive technology solutions targeted at older adults that are autonomy-enhancing (e.g., electric bikes or social robots).	A different innovation strategy is provided, which is simpler, easier to use, and offers affordable technologies and services. Christensen (1997) provided a different kind of market diffusion of technological innovations that emphasizes affordability as the driver rather than communication (Rogers, 2003). The new product first encroaches on the low end of the existing market and then diffuses upward to mainstream customers (Schmidt & Druehl, 2008).	The theory is considered as a "powerful means for developing and broadening new markets" (Govindarajan & Kopalle, 2006a, p. 190) like the older adult segment (Kohlbacher & Herstatt, 2011). It stimulates critical reflection on the "chasing newness understanding of innovation" (Gomez, 2015, p. 10). It assumes that the product itself does change over time, which seems to be realistic in a competitive market environment.	The theory favours newcomers (Lepore, 2014). 'Disruption' has become a buzzword with unclear meaning (Lepore, 2014). It remains unclear if and how disruptive innovations might create value for the elderly (Govindarajan et al., 2011; Klenner et al., 2013). It lacks user/consumer orientation and market segmentation (Daneels, 2004; Lepore, 2014). It is unclear "whether there is any systematic way to identify new disruptive opportunities for applying existing technology or products" (Yu & Hang, 2010, p.12).

Theory/model/ framework	Description	Typology of population	Relevant criteria and key constructs	Relevance and limitations for thesis	
				Pros	Cons
<b>Accelerating diffusion of proven technologies (ADOPT) (Wang et al., 2011)</b>	The ADOPT model highlights various factors and proven strategies that support the diffusion of health technology to older adults, their collaborators, and their context.	At the centre of the framework are the older adults themselves, as well as external collaborators and context factors that affect older adults most closely.	The ADOPT model is comprised of seven strategies for collaborators to consider for promoting technology diffusion: (1) design relevant, user-friendly technology, (2) establish technology value, (3) create business model, (4) promote technology, (5) form partnerships, (6) identify technology champions, and (7) coach users.	It is one of the few models that entails marketing and commercial aspects related to adoption and acceptance of technologies by older adults. It specifically addresses older adults.	The model was developed only through a literature review. The primary targets are collaborators (e. g., technology developers). As such, the model does not provide detailed insights about user or technology characteristics. It does not offer a differentiation of user types
<b>Acceptability model for assistive technologies (Tinker &amp; McCreddie, 2005)</b>	The model suggests that the 'felt need' (the individual feels that it needs help) is central to technology adoption and more important than chronological age. When older persons have specific needs (e. g. mobility needs) and the device can contribute to fulfil them, the acceptance is high and the effect of (chronological) age becomes less important (Flandorfer, 2012).	The model is targeted toward older adults in their home setting. The authors asked a purposive sample of older adults (70 years and older) about their use and experience with various assistive technologies.	The model uses 'felt need' as the key (socio) psychological individual factor (Flandorfer, 2012) that is affected by two key determinants: the user characteristics (e. g. mobility needs) and housing factors (e. g. accessibility). The 'felt need' of an older person is related to various required characteristics of assistive technologies (like reliability, simplicity and efficiency) resulting in the acceptability of an assistive technology.	The model considers the environment in which older adults live. It specifically addresses the capabilities of older adults.	The model emphasizes individuality and intentionality ('felt need') as key underlying mechanisms that affect behaviour. It does not offer a differentiation of user types. It is only applicable to assistive technologies.
<b>The Create model of ageing and technology (Rogers &amp; Fisk, 2010; Fisk et al., 2009)</b>	The model suggests that a successful technology or product will depend on the match between user capabilities and the demands imposed by the system as well as by the task being performed. In addition, the context of use is highly relevant and may hinder or support interactions (Rogers & Fisk, 2010).	The model incorporates older adults in their home setting and specific age-related determinants.	The model incorporates three elements: the user, tasks, and technology and visualizes the relationships between the three elements. The model includes factors related to the social and physical environment including family, friends and others as factors affecting technology use.	The model considers psychological factors (e.g., self-efficacy), which are relevant for innovation adoption. It is applicable for a wide range of technologies. It relates characteristics of user capabilities, task, and technology, rather than technology in isolation.	The model does not offer a differentiation of user types.  It neglects commercial aspects. Thus, managerial implications are unclear.  The model is static. However, usage patterns might change over time.

## **2.5 Synthesis of theoretical perspectives – initial research model**

The literature review provides a critical evaluation of theories and models from various disciplines related to the study. The research has extended the model created by Shih and Venkatesh (2004), which was derived from a quantitative study about usage of personal computers. Thus, adaptations and extensions were required in relation to household technology and the specific situations of older users. This results in an initial framework that melds and extends distinct conceptual elements from separate theories. The initial model consists of three key components: dimensions/determinants, user profile (typology), and outcomes. A further component illustrates areas for a possible application of the disruptive innovation strategy.

From the literature review, it can be assumed that independent living is perceived very differently among older adults and the role that technology plays might vary extensively because of the diversity of this segment. The first research question (RQ1) is as follows:

### **How are independent living and the influence of household technology perceived by the elderly?**

Becoming dependent on others is a frequent consequence of physical and psychological handicaps (Fisk, Rogers, Charness, Czaja, & Sharit, 2009; Higgins & Glasgow, 2012; Kohlbacher et al., 2014). It can be expected that older people try to prevent this and do not want to depend on others (Kohlbacher et al., 2014). For the author, domestic household technologies could provide solutions to facilitate domestic practices, thus independent living. Further, it can be assumed that various determinants affect the usage patterns of household technology and have a more or less direct influence on domestic practices. Therefore, a need exists to understand the everyday challenges and the strategies of how older adults cope with household technology and domestic practices and why these strategies have developed in the way they have. Based on that, the author created the following research question (RQ2):

### **What are determinants that affect usage patterns of household technology?**

Typically, two general approaches to market segmentation are considered by managers: product and people-oriented (Plummer, 1974). Many marketers continue to use age-based segmentation approaches (Mathur et al., 2005). However, past research has shown that age does not directly affect one's behaviour (Chen & Chan, 2011; Moschis et al., 1997). There is a pervasive view throughout various disciplines (Joyce & Loe, 2010; Kohlbacher et al., 2014; Niemelä-Nyrhinen, 2007; Peine & Neven, 2011; Wang et al., 2011) that the segment of elderly users and customers is not a homogenous market. It is rather a "conglomerate of many (sub-) markets – partly-overlapping existing ones" (Herstatt et al., 2011, p. 4). This is puzzling because although many claim to acknowledge the diversity, the underlying assumptions of most models neglect different user segments and usage patterns. This inaccurate user representation seems to be a major shortcoming in the existing technology adoption models and too vague to define directions for future product developments. The systematic literature review found out that some older adults seem to be more resistant to new technologies because they do not perceive a relative advantage for some new technologies with additional features (Chen & Chan, 2011; Heinz et al., 2013; Iyer & Reisenwitz, 2010; Jakobs et al., 2008; Neven, 2010). "Innovation resistance seems to be a normal, instinctive response of consumers" (Ram & Sheth, 1989, p.11). However, it seems to vary in degree among older adults (Chen & Chan, 2011; Ram & Sheth, 1989). In so far, a clarification of determinants impeding or supporting use is required as prerequisite to define strategies to overcome or lower usage barriers. In this thesis, a pre-defined list of determinants from the Use Diffusion model (Shih & Venkatesh, 2004) is taken as a basis to describe household technology use in different directions. However, the UD model is too generic and was not intended for older adults. Thus, the list of determinants model has to be adapted to a different context (Alvesson & Sandberg, 2011) and needs to be revised with determinants (life course and technical self-efficacy) that are more appropriate to the specific situation of older adults. They are added to the personal dimension.

**Table 13: List of dimensions and determinants**

	Original list of determinants (Shih & Venkatesh, 2004)	Initial list of determinants (after literature review)
Household Social Context	Household communication	Household communication
	Competition for limited resources	Competition for limited resources
	Prior experience with using technology	Prior experience with using technology
Technological Dimension	Technological sophistication	Technological sophistication
	Complementary technologies	Complementary technologies
Personal Dimension	Use innovativeness	Use innovativeness
	Frustration with technology	Frustration with technology
		Life course (Chen & Chan, 2011; Mathur et al., 2005)
		Technical self-efficacy (Bagozzi & Lee, 1999; Chen & Chan, 2011; Norman, 2013; Rogers & Fisk, 2010)
External Dimension	External communication	External communication
	External technology access	External technology access
	Family exposure to target media	Family exposure to target media

If ageing-in-place is to be achieved, then narrow models of behavioural change (like TAM), which are still used by many scholars (e.g. Jakobs et al., 2008; Mitzner et al., 2010), need to be abandoned. The “undersocialized methodological individualism of behavioural models” (Hargreaves, 2011, p. 82) and the overemphasis of user needs (Peine & Neven, 2011) both lead to a narrow view of social life because they do not place enough focus on habits and routines as barriers to innovation adoption (Bagozzi, 2007; Limayen, Hirt, & Cheung, 2007; Venkatesh et al., 2012). As such, focussing only on the attitudes towards the use of domestic appliances is inadequate. The author will use and expand on the model of Shih and Venkatesh (2004) as a starting point because the main contribution to previous models discussed (Davis, 1989; Rogers, 2003;

Venkatesh et al., 2003) is the identification of a fourfold typology of users (intense, specialized, non-specialized, and limited). This research posits that different user segments exhibit different levels of capabilities in technology use and interest in future technology acquisition. Identifying different use patterns takes a central position in this thesis because it divides the elderly market into different user segments. This research assumes that innovation acceptance has a greater chance when the product is perceived as consistent with existing usage patterns, which relates to Rogers' (2003) criterion of compatibility. Therefore, older adults' usage patterns must be thoroughly analysed so that innovations may be developed to be compatible with current usage behaviour (Heidenreich & Spieth, 2013; Ram & Sheth, 1989; Rogers, 2003). So for product management, it becomes a matter of bandwidth and thinking about a range of user typologies instead of 'older people.'

As this thesis is part of the ageing and innovation discourse, it is important to reconsider the intended outcome before the innovation and technology strategies are defined. Shove et al. (2012) provided a helpful framework of interrelated, linked elements that was used for the exploration of environmental behaviour change (Hargreaves, 2011) and innovation studies about bathing and eating practices (Kuijter & De Jong 2011; Warde, 2005). In this thinking, the author pays attention to normally unquestioned skills and objects that would be neglected in cognitivist models of behaviour change. This is exemplified by understanding the 'target practice' of older adults doing the laundry in context. This approach helps to identify areas of innovation and offers pathways to find opportunities for interventions to support the elderly in their homes. In this way, practice theory is used in a broader and more holistic manner as a means to understand what actually happens. The synthetic framework incorporates Shove et al.'s (2012) three-element framework to stimulate interdisciplinary thinking. Innovative products or services are not simply solutions for existing needs because they, and the practices of which they are a part, have transformative potential in the life of older adults (Shove, 2003; Shove et al, 2012). As such, the research explicitly considers objects (products or technologies) embedded in social domestic practices to support independent living. That is the reason why the accomplishment of a practice (as the adapted three-element framework by Shove et al., 2012) is integrated as the main 'goal' or outcome of technology use. Therefore, the conceptual model directs the

attention of innovation management to the three-element framework (objects, skills, images), which is represented as an assembly of cogs. This research follows previous studies that suggest looking beyond the three elements in the focal practice, to elements in 'neighbouring' practices (Shove et al., 2012; Spotswood et al., 2015). In viewing the broader effects of a target practice by "zooming out" (Nicolini, 2013, p. 231), doing the laundry can be directly linked to other practices, like dressing, which is closely implicated in the expression of identity (Twigg, 2014).

Wolfe and Synder (2003) pointed out that the ageing segment "is the only adult market with realistic prospects for significant sales growth in dozens of product lines" (p. 21). Although the market for the elderly is constantly growing (United Nations, 2013), it is still neglected by many established companies (Kohlbacher & Herstatt, 2011; Lew et al., 2015). Thus, an established company serving its mainstream (current) customers and simultaneously trying to enter the emerging segment of elderly customers with a different market strategy type, namely disruptive innovation, must consider a different business model. Thus, the strategic implications are addressed by the following research question (RQ3):

**What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?**

Despite the increased attention that the topic of ageing and technology is receiving from various academic disciplines, policy, and business practice (Coughlin et al., 2007; Czaja et al., 2006; Joyce & Loe, 2010; Kohlbacher & Herstatt, 2011; Mollenkopf et al., 2010; Peine & Neven, 2011); conceptual and empirical research that integrates the various disciplines is relatively scarce. In particular, there seems to be a dearth of applications of well-grounded and established frameworks from the field of innovation management to the case of the daily domestic activities of older people. This research assumes that different usage patterns "result in different levels of interest in future technology acquisition" (Shih & Venkatesh, 2004, p. 69), either sustaining or disruptive innovations. In this line of thought, identifying different user typologies offers a more nuanced view of user and customer behaviour and helps to diversify the elderly segment, thus fostering the identification of different types of future strategies. Finally, based on a novel, use-oriented market segmentation

approach, the research sought to clarify a possible application of simpler, more familiar, and affordable solutions, namely disruptive innovations. At a more strategic level, it posits that disruptive innovation might help to overcome barriers that cause resistance to innovation (Ram & Sheth, 1989) among older consumers.

An initial conceptual model was developed that synthesizes the results from the literature and concludes the chapter. Based on the initial research model (Figure 23), the author will elaborate on three strands of theory, which is a novel approach in academia. By elaborating on the elements of these theories: use diffusion (Shih & Venkatesh, 2004), disruptive innovation theory (Christensen, 1997, 2013), and social theories of practice (Reckwitz, 2002; Schatzki et al., 2001; Shove et al., 2012); the author will reflect on how these elements can be incorporated and synthesized in a revised framework. In following Fink's seven-step approach (2009), the initial research model provides an adaptation and extension of the model created by Shih and Venkatesh (2004). This initial model (Figure 23) is meant to illustrate the range and type of determinants that must be considered in the study of domestic appliance interactions for older adults. It consists of three key components: dimensions/determinants, user profile, and outcome (of technology use). A further component illustrates areas for a possible application of the disruptive innovation strategy. The initial research model and the following research questions guide the research. It has to be underlined that qualitative research findings should be used here to gain understanding and provide directional insights. As such, the following illustration should be seen for its heuristic value.

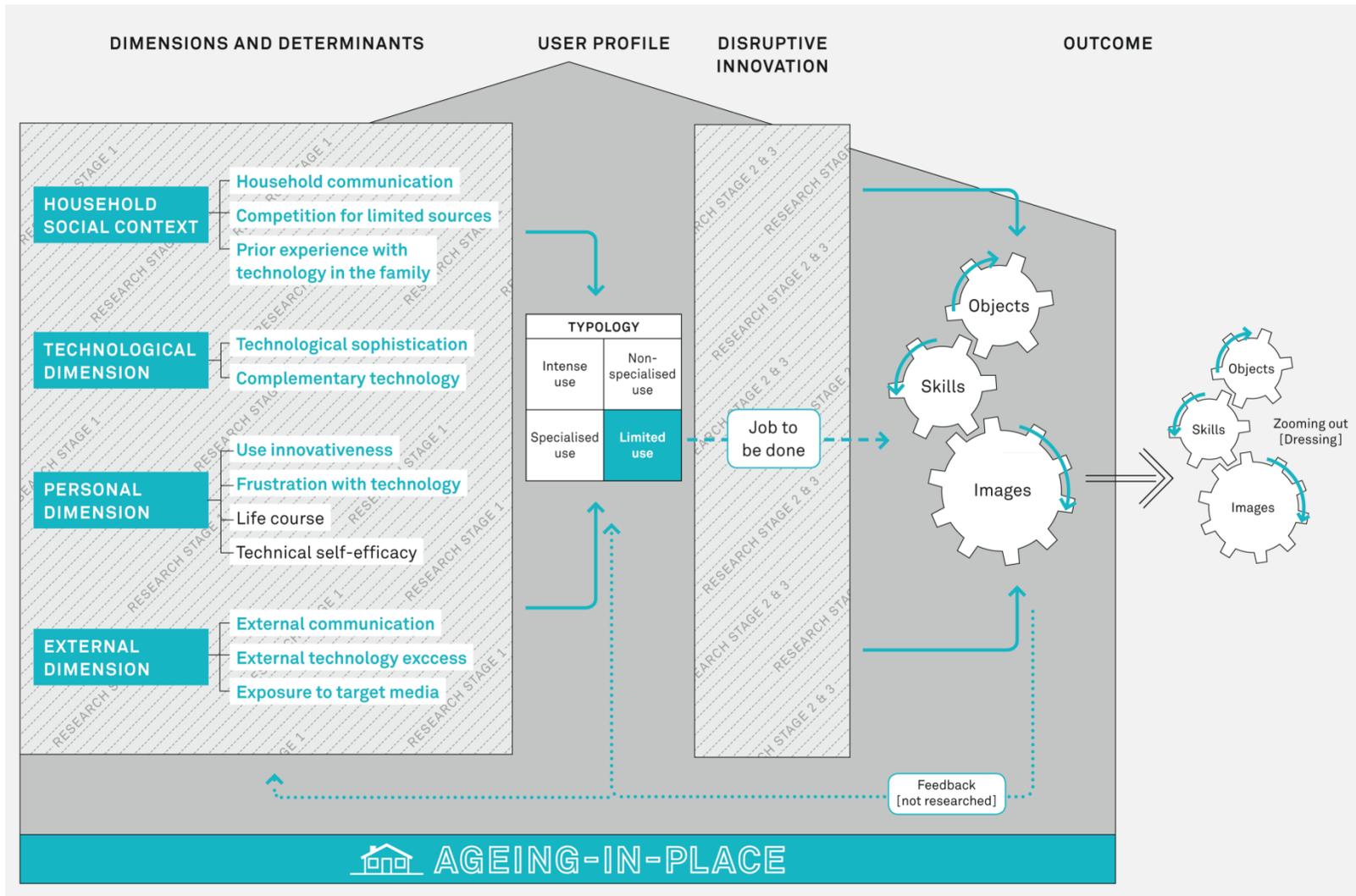


Figure 23: Initial research model (based on Shih & Venkatesh, 2004 and Shove et al., 2012)

## 2.6 Theory building process

This section addresses aspects of the theory building process identified by Christensen (2006) and “problematization as a methodology” by Alvesson and Sandberg (2011, p. 248). To develop an integrative conceptual framework is an essential part of this study. Therefore the author seeks to clarify determinants and their relative importance affecting technology use. As a consequence, it is necessary to go back out into the field to explore their relative importance. Christensen (2006) described a cycle in theory building as a process that consists of two major stages: the descriptive stage and the normative stage. Each of these stages consists of three steps.

### Descriptive stage of theory building

The descriptive stage is a preliminary stage because researchers must pass through it to develop normative theory (Christensen, 2006). The following figure describes the three descriptive theory-building steps: observation, categorization, and association.

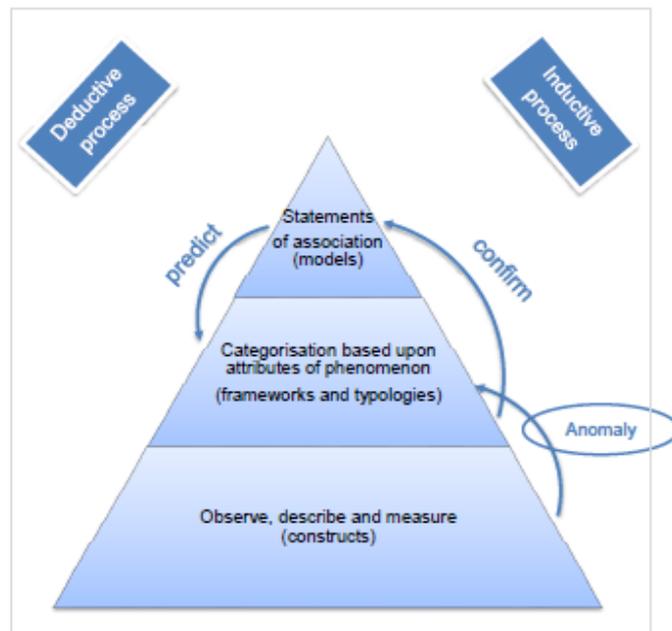


Figure 24: Theory building process (Christensen, 2006, p. 40)

Step 1: To Christensen (2006), observation is used to describe and measure what was discovered. This is the base of the pyramid. Here researchers observe phenomena, describe and measure what they see (Christensen, 2006).

In this line of thought, by offering a ‘thick’ description (LeCompte & Schensul, 2010) of a domestic practice, it will become possible to increase the awareness of routinized actions, habits, and conventions in daily life.

Step 2: The next step of the pyramid, categorization, consists of classifying the phenomena into categories. “Categorisation simplifies and organises the world in ways that highlight possibly consequential relationships between the phenomena and the outcomes of interest” (Christensen, 2006, p. 40). As in the current research, it could be stated that the author has already prepared an initial conceptual model with determinants derived from the literature review. However, the author is applying them in a new context. Thus, the initial list of coding categories requires further exploration. Those categories will be modified, refined, and new ones will be added after the fieldwork and following analysis procedure.

Step 3: The top of the pyramid consists of exploring the relationship between category defining attributes and the observed outcomes (Christensen, 2006). This relationship will be further refined during the research process and will lead to a conceptual model.

### **Anomalies in descriptive theory**

Moving from the bottom to the top is an inductive process (Christensen, 2006; van de Ven, 2007). For inductive studies, articulating one’s motivation not only involves reviewing the literature to illustrate ‘gaps,’ but also explaining why it is important to fill this gap (Alvesson & Sandberg, 2011). To improve theory, the three steps could also be completed in reverse. That would result in a deductive process (Christensen, 2006; van de Ven, 2007): testing the hypotheses that were inductively formulated. In the case, when an anomaly is found, the researcher has to move to the categorization stage and needs to look for new categories that explain the discovered anomaly (Christensen, 2006). In the context of this study, the identified anomaly is related to the low technological acceptance of older adults. The author has to go back to the categorization stage and validate existing determinants and identify new ones. In addition, the author has to pay attention to influences that underpin determinants and factors which helps to explain why high-tech strategies are not adopted by older adults. Finally, this results in an improved theory. Alvesson and Kärreman (2007),

suggested to actively seek and create surprise and mystery in the work as a means to open up established theory. The authors argued that coming up with new ideas is less an inductive matter and more a matter of rethinking established theories and their underlying assumptions. Therefore, the author does not follow practice theory in a strict theoretical manner, but uses it as a platform that provides a vocabulary, a 'lingua franca', and an orientation to produce new knowledge on a social phenomenon.

### **Theory building and the implication of the present research**

At the point that a theory gives guidance about the actions required to lead to the desired result, it completes the transition from descriptive to normative theory. "A normative theory built on well-researched categories of circumstances can help managers, given their circumstances, predict accurately what actions will and will not lead to a desired result" (Christensen, 2006, p. 43). During the research, primary data is gathered, which equates to description and observation in the theory building process. Transcripts are made and used as a basis for data analysis. In this study, the initial categories as derived from the initial model were modified and refined and relationships between categories and the observed outcomes explored, which equates to association in the theory building process. The author followed the approach of "problematization as methodology" (Alvesson & Sandberg, 2011, p. 248). It departs from a pure gap-spotting approach and shifts to a "dialectical interrogation" (Alvesson & Sandberg, 2011, p. 252) of one's own position, stakeholder views, and the domain of literature. By carrying out a practice based study, the author scrutinizes the underlying assumptions of free choice and user autonomy that underpin established models of behaviour change and consumer empowerment. This approach targeted at assumption challenging should provide a more realistic picture why older adults show a higher resistance for new technology than other groups and how alternative strategies might provide better support.

## 2.7 Chapter summary

During the literature review, the author determined that the initial research questions were too general and had to be amended. The following table summarizes the main findings of the literature and finalizes Chapter 2.

**Table 14: Expansion table**

Research Questions	Research Objectives	Literature Review Results
How to identify and manage entrepreneurial opportunities for an ageing consumer goods market?	The research study on hand is to contribute knowledge and managerial implications for companies in the consumer goods segment by exploring the opportunities of the emerging segment of elderly customers.	Unclear managerial implications out of disruptive innovation theory (Adner, 2002; Anthony et al., 2008; Christensen; 1997, 2013; Danneels, 2004; Selhofer et al., 2012; Steen, 2013) related to elderly consumers (Herstatt et al., 2011; Kohlbacher et al., 2014; Steen et al., 2011). Throughout the research, the theory of social practices is used, which looks at the elements 'objects', 'skills', and 'images' related to social practices, including domestic chores.
(1) How are independent living and the influence of household technology perceived by the elderly?	(1) To understand the perception and the meaning of independent living and ageing-in-place by the elderly and the role household technology might play.	Ageing-in-place and independent living as main wish of elderly. Technology as key strategy to support this wish (Gaßner & Conrad, 2010; Mollenkopf et al 2010). Strong empirical orientation towards 'individuality' and 'autonomy'.
(2) What are determinants that affect use patterns of household technology?	(2) To gather and validate determinants affecting use of household technology. To identify usage patterns as a basis for market segmentation and product innovation.	Various models (e.g., DOI, TAM, ADOPT) neglect a deep insight in different use patterns of older adults. To overcome innovation barriers among older adults, their usage patterns need to be thoroughly analysed, so that innovations may be developed which are compatible with current usage behaviour (Ram & Sheth, 1989). The use diffusion model by Shih and Venkatesh (2004) was modified as an approach to identify different user segments among older adults (persona typology). The synthetic framework assists to identify areas of disruptive innovation to facilitate daily practices (Schatzki et al., 2001; Shove et al., 2012; Warde, 2005) and the job to be done (Christensen & Raynor, 2003; Goffin, Lemke, & Kohner, 2010; Goffin et al., 2012) in the domestic domain (Loe, 2015).
(3) What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?	(3) To suggest an entrepreneurial approach serving current mainstream customers and new (potential) elderly customers embedded in a new business model framework.	The research posits that different usage patterns "result in different levels of interest in future technology acquisition" (Shih & Venkatesh, 2004, p. 69), either sustaining or disruptive innovations. Disruptive innovation is primarily a business model problem (Christensen & Raynor, 2003; Johnson et al., 2008). ECO and MCO need to co-exist (Chesbrough, 2010).

## **3 Research methodology**

### **3.1 Discussing basic research philosophies**

The research philosophy reflects a set of philosophical standpoints or worldviews with regard to ontology (the nature of reality) and epistemology (how we gain knowledge of what we know). Easterby-Smith et al. (2008), like other authors (e.g., Creswell and Clark, 2011; Guba & Lincoln, 1994; Mayring & Fenzl, 2014; van de Ven, 2007), have discussed contrasting philosophical worldviews that researchers can adopt. “It is better to choose a philosophy of science than to inherit one by default” (van de Ven, 2007, p. 36). However, the issue of research paradigms is not a straightforward matter. There is no general agreement in the literature regarding the types, terms, and numbers of key research paradigms (Easterby-Smith et al., 2008; Flick, 2009; Saunders et al., 2007; van de Ven, 2007). Usually, a key distinction is made between positivist and social constructionist approaches (Easterby-Smith et al., 2008; Steen, 2008), which is helpful as a starting point. Like Steen (2008), Easterby-Smith et al. (2008) related social constructionist approaches to the idea that reality is constructed by following a stakeholder perspective rather than by objective or external factors. In this paradigm, the researcher should be concerned about the complexity of the ‘whole’ situation (Easterby-Smith et al., 2008). In a positivist approach, the assumption is that the social world exists externally. A schematic overview of the implications is provided by Easterby-Smith et al. (2008, p. 59):

**Table 15: Contrasting implications of positivism and social constructionism (Easterby-Smith et al., 2008, p. 59)**

	<b>Positivism</b>	<b>Social constructionism</b>
<b><i>The observer</i></b>	must be independent	is part of what is being observed
<b><i>Human interests</i></b>	must demonstrate causality	are the main drivers of science
<b><i>Explanations</i></b>	should be irrelevant	aim to increase general understanding of the situation
<b><i>Research progress through</i></b>	hypotheses and deduction	gathering rich data from which ideas are induced
<b><i>Concepts</i></b>	need to be operationalized so that they can be measured	should include stakeholder perspectives
<b><i>Unit of analysis</i></b>	should be reduced to simplest terms	may include the complexity of 'whole' situation
<b><i>Generalization thought</i></b>	statistical probability	theoretical abstraction
<b><i>Sampling requires</i></b>	large numbers selected randomly	small numbers of cases chosen for specific reasons

In another approach, Saunders et al. (2007) extended the research philosophies applied in management research by adding pragmatism. There are other sources that broaden the range of paradigms even further by introducing critical realism, logical positivism, pragmatism, and relativism (van de Ven, 2007). For the purpose of this research, the two contrasting implications of positivism and social constructionism and additionally the positions of (critical) realism and pragmatism will be considered as they are well established in ageing and technology studies. To add critical realism seems appropriate, as van de Ven's (2007) engaged scholarship builds on a critical paradigm. The position of pragmatism is considered as well because this methodology seems to have relevance for studies that offer contributions to practice. To establish the appropriate research design for this research, it seems to be appropriate to consider each research paradigm and to reflect on its applicability in relation to the nature of research. This section needs to take into account the vague nature of the research topic. Positivism was chosen as the first paradigm to evaluate. The author could ask about the importance of particular features and conduct surveys to gather data about purchasing criteria. He could engage in

experiments like usability studies about household appliances like washing machines, which have a positivist character. This could be particularly helpful to discover handling and user interface problems. In doing so, the author could prompt respondents to think about existing product features (Goffin et al., 2012). For the phenomena under study, focussing only on the appliance 'is too little.' A pure positivist approach tends to overlook the "unresolved issues and unarticulated needs" (Goffin et al., 2012, p. 46). As discussed in the previous chapter, ageing-in place requires a deeper understanding and an "open-minded analysis" (Euchner & Henderson, 2011, p. 5), which can be difficult using a positivist approach. The aim of this research is to appreciate the different feelings, meanings and expectations that older adults place upon independent living in their homes and the role household technology can play, whether verbally or non-verbally. As Kumar and Whitney stated (2007), "looking at activities that surround the product, rather than getting reactions to the product ... leads to breakthrough ideas that are grounded in how people are living" (p. 49). It seems that the only way to really understand an unfamiliar social world is to be there (van Maanen, 2010). The adoption of a positivist stance would be inappropriate as most of the contextual meaning would be lost. To summarize, positivism does not work for an understanding of technology use related to ageing-in-place under these special circumstances, even though many studies about ageing and technology are based on a positivist paradigm (Malanowski et al., 2008; Mollenkopf et al., 2010). An alternative to be considered is that of critical realism, which integrates some of the differences of alternative philosophies (van de Ven, 2007). It seems that critical realism would provide a balanced view and the necessary flexibility within the research (van de Ven, 2007). However, it appears that the critical realist position, which follows an objective ontology (van de Ven, 2007) on observing facts, leads to the assumption that there is truth. Van de Ven (2007) suggested a critical realist paradigm for scholars adopting 'engaged scholarship.' However, the aim of this research is to explore and identify the subjective challenges that the elderly have in their daily activities. Partners, children, and other stakeholders (e.g., doctors) might see the situation differently. Furthermore, innovations are managed in a complex and dynamic business environment with many stakeholders and often with conflicting and changing goals (Alvarez & Barney, 2010; Goffin & Mitchell, 2010).

Since the positivist and the (critical) realist paradigms do not fit an explorative research attempt, the social constructivist paradigm could be the option to consider. Conventional criticism regarding the positivist approach often leads to social constructivism, which should compensate some of the ‘flaws’ of value-free (detached), reductionist research (Easterby-Smith et al., 2008; Saunders et al., 2007). Scholars (Easterby-Smith et al., 2008; Guba & Lincoln, 1994) have distinguished constructivism from other paradigms by its relativist stance. The wish to understand the living situations of older adults links to a social constructionist influenced methodology, which holds that realities are apprehensible in the form of multiple, intangible mental constructions that are socially based (Guba & Lincoln, 1994). Further, “social constructivism views reality as being socially constructed” (Saunders et al., 2007, p. 109). From the perspective of gerontechnology, Chen and Chan (2011) recommended, “to take into account context specific factors” when it comes to technology use (p. 9). Taking this perspective, the social constructionist view and a focus on the discourse alone seems unsuitable. Significant factors in understanding the influence of the context of use are the ability to acknowledge bodily changes and challenges that the latter part of the life can bring about (Day & Hitchings, 2011) and to comprehend the physical burden of older consumers (Lai et al., 2008). As Chipchase and Steinhardt (2013, p. 124) suggested, “...the best place to learn is where the doing gets done,” which can be viewed as a distinctive way to acknowledge the physical situation of the elderly and a way to understand and explain why older adults have different experiences and expectations toward technology use. It also allows the author to triangulate between the espoused theories (what the elderly participants say) and their theories-in-use (Argyris, 2010). From a methodical perspective, there is a wealth of studies emphasizing a need for integrating the “voice of the customer” (Goffin et al., 2012) through participatory methods (Flandorfer, 2012; Kohlbacher, 2008; Leonardi, Mennecozzi, Pianesi, & Zancanaro, 2008; Peine & Neven, 2011), because to reduce the “cognitive distance” (Lew et al., 2015) between researchers and older adults might be helpful to achieve more accurate customer requirements. This leads to more active involvement of older people in the development process as illustrated in the table below by Creswell and Clark (2011). Finally, that perspective assists with the aim to provide more appropriate solutions to help the elderly achieve their wish of ageing-in-place.

However, little attention is given to this approach in the included studies. The lack of attention to that issue might explain why assistive technologies have not been widely used by older adults (Coughlin et al., 2007; Thielke et al., 2011; Neven 2014), rendering them “obviously not for me” (Neven, 2010, p. 335).

**Table 16: Elements of worldview and the implications for practice (Creswell & Clark, 2011, p. 42)**

Worldview element	Postpositivism	Constructivism	Participatory	Pragmatism
Ontology (what is the nature of reality?)	Singular reality (e.g., researchers reject or fail to reject hypothesis)	Multiple realities (e.g., researchers provide quotes to different perspectives)	Political reality (e.g., findings are negotiated with participants)	Singular and multiple realities (e.g., researchers test hypotheses and provide multiple perspectives)
Epistemology (what is the relationship between researcher and that being researched?)	Distance and impartiality (e.g., researchers objectively collect data on instruments)	Closeness (e.g., researchers visit participants at their sites to collect data)	Collaboration (e.g., researchers actively involve participants as collaborators)	Practically (e.g., researchers collect data by “what works” to address research questions)
Methodology (what is the process of research?)	Deductive (e.g., researchers test an a priori theory)	Inductive (e.g., researchers start with participants views and build “up” to patterns, theories, and generalizations.	Participatory (e.g., researchers involve participants in all stages of the research and engage in cyclical reviews of results.	Combining (e.g., researchers collect both quantitative and qualitative data and mix them)

To sum up, understanding the multiple realities of older adults leads to a social constructivist position that includes an emphasis on the context of use (Creswell & Clark, 2011). Following this approach, the author is “actively engaged in facilitating the ‘multivoice’ reconstruction of his or her own construction as well as those of other participants” (Guba & Lincoln, 1994, p. 115). As a complementary approach, participatory elements are used throughout the study, which is a “process of joint inquiry and imagination” (Steen, 2013, p. 27) to provide more accurate user representations.

### 3.2 Methodological consequences of the chosen research philosophy

In adhering to a social constructivist paradigm that includes multiple realities (Creswell & Clark, 2011), the author uses Steen's framework (2008), to evaluate a variety of approaches that could be employed or even combined: participatory design, co-design, empathic design, and applied ethnography. In a design study about bathing practices, Kuijter and De Jong (2011) used this framework in combination with practice theory. The content can be differentiated as present or future orientation and the kind of user involvement. All can be understood as attempts to involve the user in the process and to lower social distance (Lew et al., 2015).

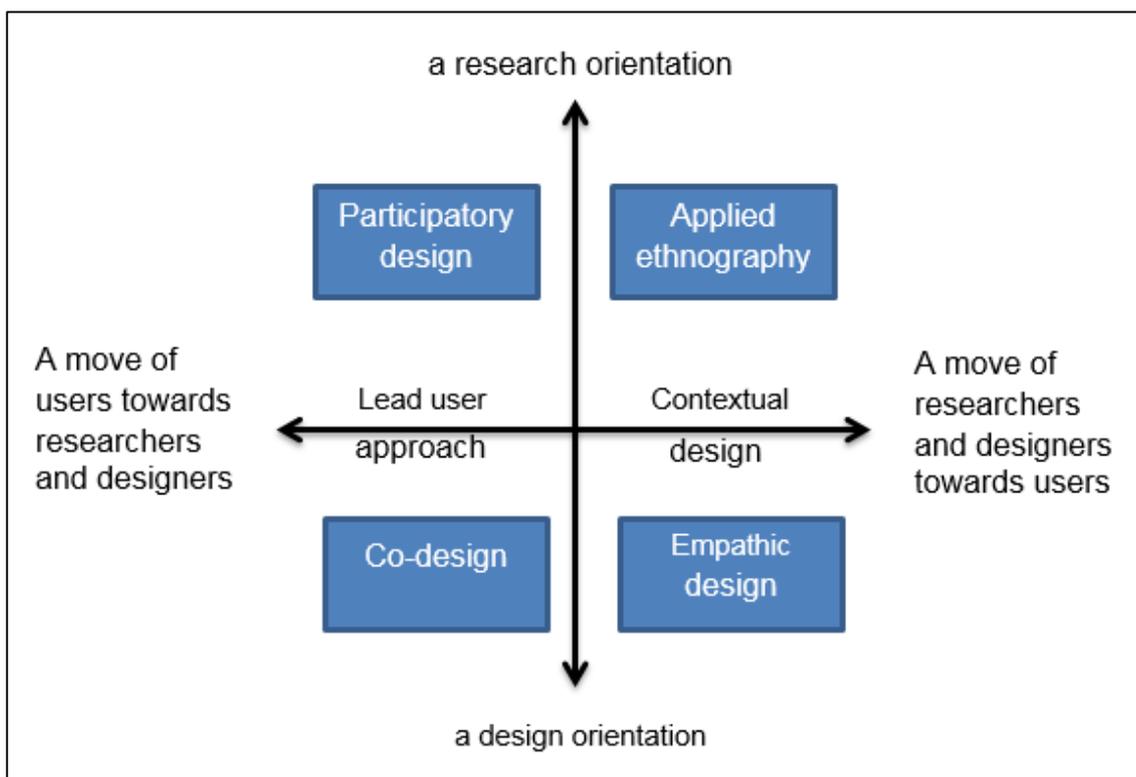


Figure 25: Research directions (Steen, 2008, p. 31)

The horizontal axis of the proposed overview plots a movement of users towards researchers and their participation in research activities versus a movement of researchers towards users and towards their domestic worlds and experiences. The vertical axis distinguishes between an understanding of the

current situation of the user ('what is'), i.e. looking for problems in the context of use, and exploring opportunities for future concepts ('what ought to be').

The author proposes to use these two directions as two axes and to plot four different approaches from Steen's framework.

- Applied ethnography;
- Participatory design;
- Co-design;
- Empathic design.

According to Brewer (2000) "ethnography is the study of people in naturally occurring settings .... by means of methods which capture their social meanings" (p. 10). A research approach based on 'applied ethnography' typically has a specific current situation or practice as a starting point. In contrast to a traditional lengthy ethnographic approach and 'going native,' which offers a deep understanding of the people's realities (Brewer, 2000; Ehn & Löfgren, 2009; Hammersley & Atkinson, 2007; LeCompte & Schensul, 2010; van Maanen, 2010). For example, when a specific problem is focused upon or when attempts are made to develop solutions to a specific problem (Steen, 2008; Suchman, 2007). This approach is termed applied ethnography because one would typically go out in the field to study and understand people to a certain extent, namely to apply findings to improve product development (Steen 2008). Various scholars (Gram-Hanssen, 2011; Hargreaves, 2011; Pink, 2009; Shove, 2003) focussed on understanding the influences of energy consumption in the home. Pink (2009) extended this approach and introduced the idea of "sensory ethnography," which directs the attention to home as composed of different sensory elements (smell, touch, taste, vision, sound). These elements are used to create and manipulate the "sensory home." Millen (2000) introduced 'rapid ethnography,' which is a collection of field methods intended to provide a reasonable understanding of users and their activities given significant time pressures and limited time in the field. Similar to applied ethnography, the core elements include limiting the research focus and scope, using key informants, and capturing rich field data (Millen, 2000). In all of these approaches, the researcher focusses on the home of the user to

explore a specific, rather narrow research field. In participatory design, users are treated as experts and an attempt is made to bring their (tacit) knowledge and skills to the research and design process (Steen, 2008). The goal is to let users and researchers work together to create a tool that will enable the user to do his or her work better. It can be linked to open innovation (Chesbrough, 2003) or networked innovation (Steen, Bulis, & Williams, 2014) and the concept of lead users (von Hippel, 2005). Steen (2013) differentiated applied ethnography as being concerned with understanding and representing current situations, and empathic design as being concerned with envisioning and experiencing alternative or future situations. Kohlbacher (2008) referred to empathic design as a way to grasp customer needs and translate them into a product concept. Furthermore, Steen (2008) argued that empathic design is different from participatory design and co-design: the latter are attempts to make users move towards researchers' and designers' activities and participate in these; the former is an attempt by researchers and designers to move towards users' activities and engage with users' experiences. To sum up, this study can be situated in the realm of applied ethnography because it is concerned with understanding older adults only to a certain extent (domestic practices) and to a specific end, namely to apply the findings to inform or inspire product and innovation management. As underscored by Dourish (2006), the domain of technology and everyday practices are mutually constitutive and cannot be separated. For the author, applied ethnography offers a point of mediation between the domain of everyday practices and the domain of technology design. It provides a snapshot based on an 'insider' perspective through home visits, so that a better understanding can be gained from older adults' realities. Based on the findings of applied ethnography, the author makes use of participatory design attempts to lower social distance (Lew et al., 2015), which provides more accurate representations of older people. By using participatory methods to envision future concepts, the study aims to provide conceptual orientations, rather than product specific suggestions. Since the study explores a rather unfamiliar terrain, it fosters an iterative process of learning.

### 3.3 Specifying the unit of analysis

The author determined that an appropriate investigative tool needed to be found to understand the living realities of older adults. Social theories of practice is a group of theories from sociology and uses practices like telemedicine and the nursing tasks (Nicolini, 2013), bathing (Kuijer & De Jong, 2011), or doing the laundry (Pink, 2004, 2012; Shove, 2003) as its main units of analysis. It shifts the level of analysis in research away from individuals to practices (Reckwitz, 2002; Schatzki et al., 2001), which are “organised nexuses of activity” (Schatzki et al., 2001, p. 56) consisting of a set of activities or actions that compose a practice. The practice of doing the laundry provided such a tool because it is ubiquitous, always on the agenda, and charged with significance (Kaufmann, 1998; Pink 2004). It is the reminder of the feminine role in doing the housework (Cowan, 1983; Shehan & Moras, 2006). Looking at the broader affects by “zooming out” (Nicolini, 2013, p. 231) doing the laundry can be linked to dressing which is closely implicated in the expression of identity (Twigg, 2014). Fashion and dressing is traditionally a youth oriented cultural field (Twigg, 2014) and plays a key role in feminine seduction. As such, “clothes lie at the interface between the body and its social presentation” (Twigg, 2014, p. 78) and embody a fundamental component of personality incorporating the notion of cleanliness (Kaufmann, 1998). By concentrating on doing the laundry, the author can learn more about the housework habits, routines, and cleaning conventions of older adults as opposed to asking a large variety of direct questions. According to Kaufmann (1998), “the washing machine ... is highly symbolic” (p. 57) because it is associated with an archetypal household task and involves a degree of organization and planning (Cowan, 1983; Edwards & Grinter, 2001; Shove, 2003).

The approach in this thesis is similar to Kaufmann (1998) who analysed couples about their relationship by using laundry as an analytical tool. Like in Kaufmann's approach doing the laundry is not the real subject but the tool in this thesis. The main interest lies in the target chosen for this study – the domestic practices of elderly persons. Research design

This section is guided by the following statement: "A research design is the logic that links the data to be collected (and the conclusions to be drawn) to the initial questions of the study" (Yin, 2009, p. 24). The research focus and the analytical strategy follows an outcome-driven innovation approach (Bettencourt & Ulwick, 2008) and explores the perception of independent living of older adults, which is first linked to domestic practices and the use of household technology in context. As a necessary prerequisite for an investigation about household technology use, this study further attempts to validate existing and to explore new determinants influencing different use patterns of older adults. This exploration requires a microscopic approach. Usage patterns need to be understood not only at the technology or product level but – more specifically – on the level of personal dimensions including the underpinning influences of habits, routines, structures, and conventions. Furthermore, external dimensions and the social context in which the practice is embedded need to be understood. Although social theories of practice are not behavioural and clearly shift the attention away from the individual (Reckwitz, 2002; Nicolini, 2013; Warde, 2005), psychological determinants seem to play a role as indicated by literature review and cannot be neglected.

A meticulous, iterative research design not relying on a single method but rather focusing on genuine phenomenological data was needed by using a multiple method approach (Kimbell, 2009; Kuijer & DeJong, 2011; Kumar & Whitney, 2007). Consequently, an exploratory approach was chosen that helped to understand the 'bodily doings and sayings' (Schatzki et al., 2001; Nicolini, 2013) of older adults. The author used applied ethnography in that he went to older adults' homes and listened to stories about their lives, domestic habits, and preferences (Creswell & Clark, 2011; Kuijer & DeJong, 2011; Pink, 2004; Shove et al., 2012). To address the specific research questions and to triangulate findings different methods were used. To Goffin et al. (2012): "Two of the most important methods from ethnography are contextual interviewing and

systematic observation” (p. 47). The author has made use of both methods; however, they appear in a particular form. In the contextual interviews, the author laid the “focus on the tasks that customers aim to complete using a product” (Goffin et al., 2012, p. 47), which is similar to outcome-driven innovation (Bettencourt & Ulwick, 2008) and understanding the job to be done (Christensen & Raynor, 2003). It is typically difficult for individuals to be open to others. In order to avoid this problem, the author used probes and stimulus material to create openness. Participatory design elements were used throughout the research and helped the author to discuss ideas for alternative ways of doing a domestic practice. To comprehend the detail of a domestic practice with each research participant a ‘normal’ laundry process was ‘enacted’ from collecting the laundry in the basket to drying it outside or elsewhere (Pink, 2012). In order to increase robustness of results and to develop the initial research framework further, other perspectives from various stakeholders and different methods were required.

#### **Usage diaries**

Self-reported data such as diaries have been used by other researchers in ethnographic studies (Goffin et al., 2010; Hammersley & Atkinson, 2007), like those conducted by Kuijer and DeJong (2011), who provided participants with workbooks to unravel their bathing practices. In this study, participants were stimulated to unravel their own laundry practices for each time they did the laundry for three weeks prior to the interviews. The participants were guided by open and closed questions such as: “How has housework changed over the last years?” or “How do you wash your favourite garments?” and “Describe the activities involved in doing the laundry.” Following the deconstruction exercise created by Kuijer and DeJong (2011), the questions were related to the appliances used, the skills required, and the image of doing laundry in order to obtain an understanding how laundry-related elements are connected. The comments in the diaries helped to formulate the approach to issues to be explored through the main research method, which are contextual interviews. The core intention was to develop the topic list for the contextual interviews and to get an initial understanding about the habits of the recruited participants. Thus, the diaries were not included in the analytical data procedure.

#### **Contextual interviews**

The degree of structure of an interview is also influenced by the design of the entire research project (Easterby-Smith et al., 2008). The more the structure is defined, the more positivistic the design is. In comparison to structured interviews and questionnaires, unstructured interviews belong to non-standardized interviews where the interviewer uses only a list of themes and key questions to be asked (Saunders et al., 2007). Semi-structured interviews lie in between the structured and the unstructured type, which facilitates flexibility and adaption for collecting further or new information and data, which may not have been planned. To achieve a more open-minded analysis (Euchner & Henderson, 2011), the author focused on outcome driven innovation (Bettencourt & Ulwick, 2008) via contextual interviews (Goffin et al., 2012), which took place personally in the home. The author started with a narrative stimulus about the general shopping behaviours like “What do you look for when you do the weekly shopping?” to explore aspects of the personal dimension and “How much has your shopping changed over the years?” In the course of the narrative, further open-ended general questions were posed such as “Can you explain to me how you do the laundry on a typical day?” followed by a more specific inquiry such as “Are there different ways of doing this?” With this approach, adapted from a list of key questions by Goffin et al. (2012, p. 47), qualitative data were collected to validate existing determinants and to identify new ones. LeCompte and Schensul (2010) described in-depth interviews as the principal form of ethnographic research. Contextual interviews add value as they allow older consumers to point to actual things in their surroundings and to use their own environment as a prompt (Goffin et al., 2012). The self-reported data from the diaries have been validated through the interviews and observations. Furthermore, as household chores are carried out routinely, it allows for an exploration of tacit knowledge (Goffin et al., 2012) and to the ability to identify gaps in the underlying espoused theories and theories-in-use (Argyris, 2010).

Attempting to apply new forms of ethnography, like ‘applied ethnography,’ is potentially problematic and can be uncomfortable for a researcher because it is not well supported by academia (Pink, 2009, 2012; Shove, 2003; Shove et al., 2012). In line with Pink’s (2009) latest approach of ‘doing sensory ethnography,’

it uses visual and sensory methodologies as ways of seeking routes to knowing about older adults' experiences. The approach in this study departs from the more classic ethnographic practices of participant observation and interviewing in various ways. It includes aspects of "visual sociology" (Harper, 2012), such as taking photos of the location and of the operation of the machines. These photos are not used as primary data, but as triggers and traces for the reflection and analytical process.

#### **Using cultural probes in the contextual interviews**

In the mock interviews, the author identified that some participants were too strictly oriented towards a laconic way of presentation. As a countermeasure cultural probes were used because they enable people "to report on their daily lives and experiences, so that these inform or inspire research or design processes" (Steen, 2008, p. 43) and were used in previous ethnographic research studies (Dourish, 2006). Participants of the study were first stimulated to unravel their own laundry practices. To Schatzki et al. (2001), "the organising phenomena resolve into mental conditions, mind is a 'medium' through which practices are organised" (p. 61). The emphasis in practice theory is on the social order, which is based on the arrangements of people and artefacts through which they coexist and how those entities relate and possess identity and meaning. As the interview continued, a 'dirty shirt' was presented. The participants were asked to consider strategies to get rid of the stains as means of deconstructing the practice of doing the laundry where it is established, in the home of the elderly.

After the initial responses to 'how to get rid of the stains on the shirt,' the shirt was handed over to the elderly person with the task to wash it prior to the second interview. In the second interview, the process activities of cleaning and the problems that occurred were discussed, including possible strategies. In so far, it involves older adults intensively in the research process in concentrated ways rather than extensively over longer periods of time.

#### **Participant observation**

The task of the author was to understand the challenges that the elderly face with their living environment (e.g., location of appliances in the cellar) and the use of physical artefacts (e.g., walking frames). To Pink (2004, 2009), video re-

enactments are not observations of naturalistic behaviour; rather they are research events in which participants re-enact everyday practices for the research process. The author followed the approach of Pink and used product demonstrations as a research event and made reference to Bourdieu's (1990) notion of knowing in practice, which suggests that knowing is generated in context of specific practices. The author followed this approach by observing and interviewing the participants while they filled and operated the washing machine because "often we cannot say what we know" (Schön, 2001, p. 9). By situating the research in movements, the implication is that new insights about unsaid aspects of life in the home that are experienced in movement are identified (Pink, 2009, 2012). Moving together around the home and talking to each other has the advantage that it is a shared experience where the elderly have the technology close at hand. This shared "laundry tour" (Pink, 2009, p. 106), which took around half an hour, allowed them to demonstrate the use of the device to the author. In the current study, doing a shared "laundry tour" offered the author encounters with the material and sensory environment of the home and memories linked to it (Pink, 2009, 2012). By deconstructing a job from the beginning to the end, the researcher gains a complete view of all the points at which a customer might desire more help (Bettencourt & Ulwick, 2008). In this study, deconstructing the laundry process and moving together with the participant through the home provided insights beyond technical appliance improvements.

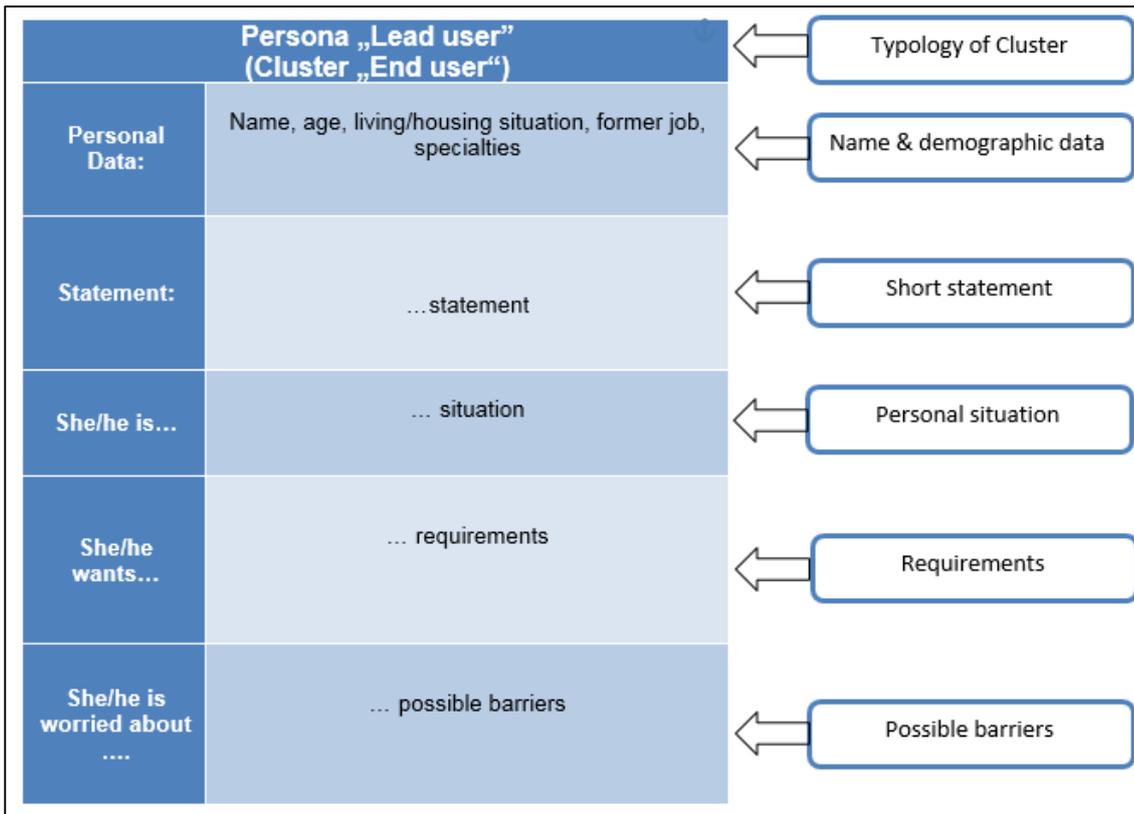
The home visits show the importance of understanding the processes 'in getting the job done' (Bettencourt & Ulwick, 2008; Goffin et al., 2012) and to experience the challenges of the living environment, to discover opportunities for innovation rather than observing how the machine is put on. As a consequence of moving down steep staircases some participants reported about their fear of falling during this kind of process activity. In observing a 78-year-old participant carrying the basket half-full with laundry down from the bathroom to the cellar provided the researcher a more realistic picture about the processes and challenges involved in doing the laundry as opposed to just observing the operation and usage of the machine.

#### **Use of personas and storyboards in focus groups**

The understanding of the diversity of this segment can be fostered and enriched by using the concept of personas, which are descriptions of fictive users (Glende et al., 2010; Leonardi et al., 2008; Lew et al., 2015; Steen, 2008). Furthermore, “personas and storylines are typically used to summarise findings from observations, interviews or workshops and to apply these in research and design process” (Steen, 2008, p. 44). Personas are invented characters with personal features, life stories, tasks, and individual daily problems. For this study the life stories of the personas are fictive in nature. However, the characteristics and challenges in daily activities are derived from the field site and include a narrative of typical problems and challenges in doing daily household activities (Steen, 2008). The use of personas lowers cognitive distance to distant target groups (Lew et al., 2015), facilitates empathy and fosters the ability to imagine future situations or new products (Glende et al., 2010; Steen, 2008).

By feeding in real data from the contextual interviews and observations allow the author to avoid generating stereotypical users that may bear no relation to the actual user’s reality. Therefore, the author makes use of the persona profile based on the framework of Glende et al. (2010) in an amended form (see below table).

**Table 17: Persona framework (Glende et al., 2010, p. 45)**



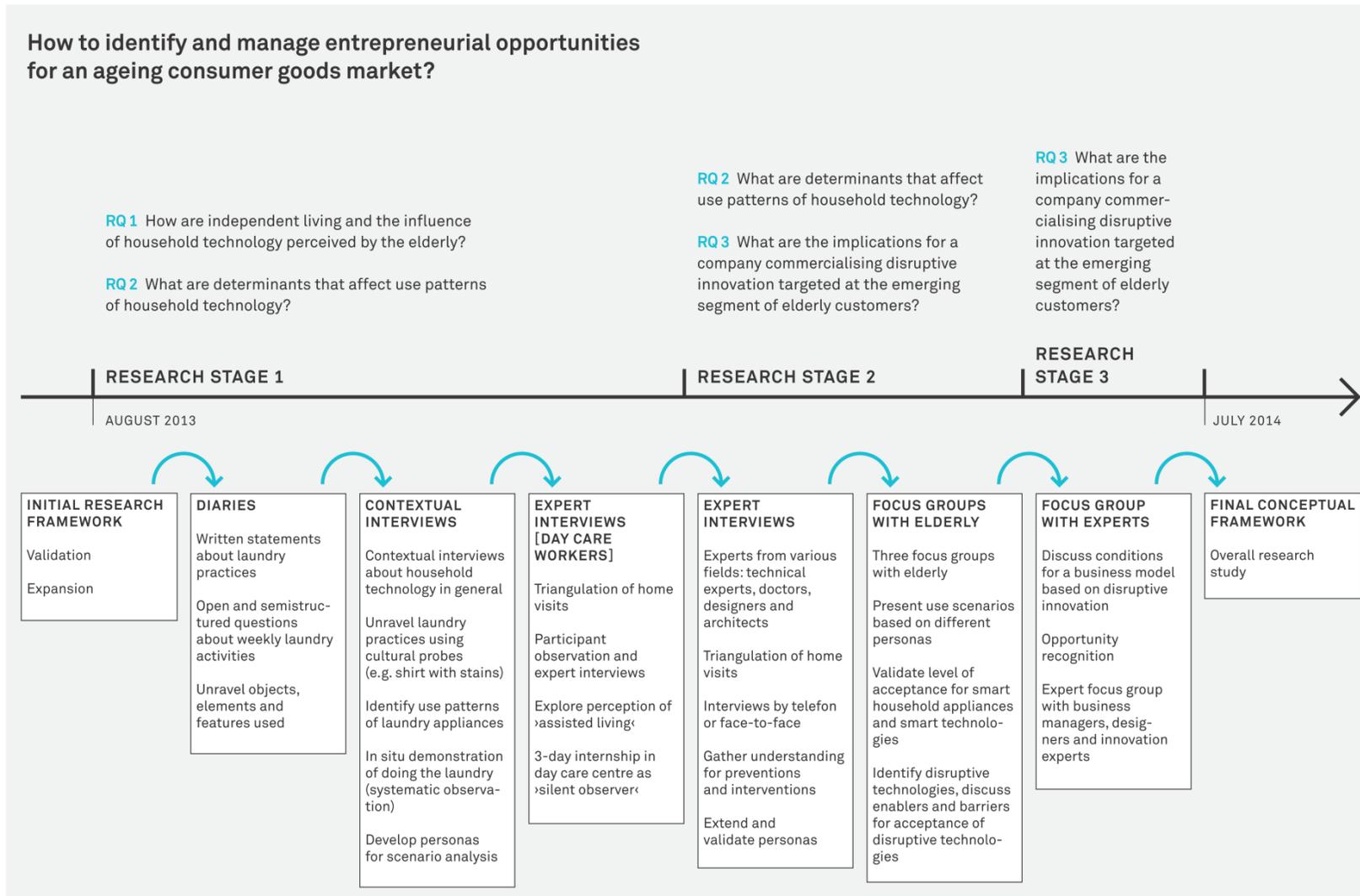
The persona framework by Glende et al. (2010) provided the author with a holistic concept, which has been integrated in the conceptual research process. The persona framework was taken as a basis to create fictive scenarios of typical daily situations which are often used in participatory design (e.g., Compagna & Kohlbacher, 2015; Kujer & DeJong, 2011). Typical user scenes and situations were developed using analogies and metaphors from multiple observations mainly from the field site observations during the home interviews. They helped to generate a shared understanding (Steen et al., 2014) between participants of the focus groups. The scenarios which included visualizations were used as ‘pathfinders’ (Steen et al., 2014) to explore an unfamiliar research field, to define conceptual directions.

To sum up, the described methodological decisions built the basis for the research design. Based on the philosophical assumption, it is clearly shown why and how certain methods were chosen and the implications of those choices for the overall research design. The main methods chosen are listed in the below overview:

**Table 18: Overview of methods used**

Method	Description	References	Application in study
Usage diaries	<ul style="list-style-type: none"> <li>To deconstruct practices</li> <li>To prepare interview topic guideline</li> <li>To focus on the tasks customers aim to complete</li> </ul>	<p>Kuijjer &amp; DeJong, 2011</p> <p>Steen, 2008</p>	Home interviews
Contextual interviews including cultural probes	<ul style="list-style-type: none"> <li>To facilitate conversation about daily practices and experiences, so that these inform or inspire research or design processes</li> <li>To use a 'stained shirt' as a cultural probe</li> </ul>	<p>Goffin et al., 2012</p> <p>Steen, 2008</p> <p>Shove et al., 2007</p>	Home interviews
Participant observation; "situated action" (Suchmann, 2007) and "walking tours" (Pink, 2004) through the home	<ul style="list-style-type: none"> <li>To study how people use their circumstances to achieve 'intelligent action'</li> <li>"An approach that follows the flow of people and things ...." (Pink, 2012, p. 33)</li> <li>Product demonstration of doing the laundry (job to be done)</li> </ul>	<p>Suchman, 2007</p> <p>Pink, 2004; Pink, 2012</p> <p>Christensen &amp; Raynor, 2003</p> <p>Pink, 2004</p> <p>Shove et al., 2012</p>	Home interviews
Personas	<ul style="list-style-type: none"> <li>To create descriptions of fictive (elderly) persons</li> <li>To gain a detailed understanding of different user characteristics. Particularly as a guideline for researchers and designers</li> </ul>	<p>Glende et al., 2010</p> <p>Leonardi et al., 2008</p> <p>Lew et al., 2015</p> <p>Steen et al., 2014</p>	Focus groups
Scenario presentation and analysis by using storyboards	<ul style="list-style-type: none"> <li>To create and evaluate use scenarios of fictive (older) persons</li> <li>Scenarios are written as stories based on information gathered from research</li> <li>Used as 'pathfinder' to explore unfamiliar terrain. Useful for concept development (not product development)</li> <li>To lower social distance to distant target groups</li> </ul>	<p>Glende et al., 2010</p> <p>Leonardi et al., 2008</p> <p>Steen et al., 2014</p> <p>Lew et al., 2015</p>	Focus groups

Finally, the figure below provides an overview of the three research stages involved and the different methods used beginning with the initial research framework and ending with the final conceptual framework. The illustration below shows the interplay and connection of the methods used and the research questions addressed.



**Figure 26: Research process of study**

### **3.3.1 Data analysis**

Content analysis was used for the analysis of the primary data, which has clear guidelines and procedures (Hsieh & Shannon, 2005; Kuckartz, 2012; Mayring 2000). Hsieh and Shannon (2005) described content analysis as a qualitative approach that is used for analysing and interpreting text data. As the data collection of interviews focuses on the textual result in the corresponding interview transcript, content analysis is regarded as appropriate. The author determined that this category based approach for analysis suits the objective of the interviews to validate and possibly extend the concepts from the literature review and the initial model. The attributes of content analysis fit the philosophical standpoint, social constructivism, used in the present research. Content analysis is seen as useful because it has rules that are clearly specified in advance for the assignment of the raw material to categories (Kuckartz, 2012; Maxwell, 2013; Mayring, 2000).

**Table 19: Initial determinants (based on Shih & Venkatesh, 2004)**

Dimensions and determinants		Description and Explanation
Household Social Context	Household Communication	<ul style="list-style-type: none"> <li>Household communication intensity</li> <li>User can discuss questions with others</li> <li>Word-of mouth communication, use of social networks, etc.</li> </ul>
	Competition for limited resources	<ul style="list-style-type: none"> <li>Access to household technology</li> <li>Competition for household technology among family members</li> </ul>
	Prior experience with technology in the family	<ul style="list-style-type: none"> <li>How long the household appliance has been used</li> <li>Age of washing machine, dryer</li> <li>Familiarity with and dependence on technology</li> </ul>
Technological Dimension	Technological sophistication	<ul style="list-style-type: none"> <li>Includes the inherent characteristics of a technology, its versatility and capabilities</li> <li>Level of comfort of users with newest household appliances, use of smart technologies (PC-tablets, etc.)</li> </ul>
	Complementary technologies	<ul style="list-style-type: none"> <li>Substitutes used for doing the laundry, washing and drying. Other resources used, e.g., dry cleaner, to dry outside, hand wash</li> <li>Relative advantage of substitutes (e.g., saving energy costs)</li> </ul>
Personal Dimension	Use innovativeness	<ul style="list-style-type: none"> <li>Being experimental and having an inclination to try different things</li> <li>Work-around to solve problems</li> </ul>
	Frustration with technology	<ul style="list-style-type: none"> <li>Complex technologies often frustrate users</li> <li>Frustration arises because technology fails to perform reliably or meet the user's expectations</li> </ul>
	Life Course (Loe, 2015; Mathur et al., 2005)	<ul style="list-style-type: none"> <li>Events in life that affect housework and the use of technology e.g., retirement</li> <li>Influence of 'technological biography'</li> </ul>
	Technical self-efficacy (Chen & Chan, 2014; Czaja et al., 2006)	<ul style="list-style-type: none"> <li>One's belief to be able to cope with technology</li> </ul>
External Dimension	External communication	<ul style="list-style-type: none"> <li>A supportive social environment: speaks to neighbours and friends, uses social networks to talk about technology</li> </ul>
	External technology	<ul style="list-style-type: none"> <li>Use of technology outside the home influences the use at home, e.g., use of dry cleaner</li> </ul>
	Family exposure to target media	<ul style="list-style-type: none"> <li>High exposure to media stimulates involvement with technology</li> </ul>

The dimensions, determinants, and descriptions that were derived from the literature review served as a pre-coding. However, the original determinants from Shih and Venkatesh (2004) were based on computer use. Thus, the operationalization for some determinants had to be adapted for the current study of household appliances. That choice was based on the research of doing the laundry by Kaufmann (1998), Pink (2004), Shove (2003), and Shove et al. (2012). With this approach, qualitative data were collected to extend and enrich the initial model using deductive-inductive reasoning.

As mentioned earlier, these initial codes are part of the initial research model and need to be validated, invalidated, and possibly extended or dismissed as a result of using them in a new context (Alvesson & Sandberg, 2011). The following subsections discuss and describe the results of the contextual interviews by offering a 'thick' description (LeCompte & Schensul, 2010) about the determinants which affect technology use. In this context, 'thick' description means not only a description of activities but also an explanation of meanings from different perspectives. To sum up, the initial research model delivers the initial codes which are validated or possibly extended or dismissed as a result of the interviews and the analyses.

Because the native language of the interviewer and interviewees is German, the transcripts are also in German and not translated into English. The analysis of the interview is done with the software MAXQDA, as the number of transcripts could not be managed manually.

#### **Analytical strategy**

In order to understand the depth and width of the phenomenon studied, an analytical strategy was required to make themes, subthemes, and their links transparent without losing too much of the context (Kuckartz, 2012). The general analytical procedure follows Kuckartz's (2012) eight-step approach. This was supported by visual presentations to get an overall overview for themes, anchor examples, and 'prototypical' quotes.

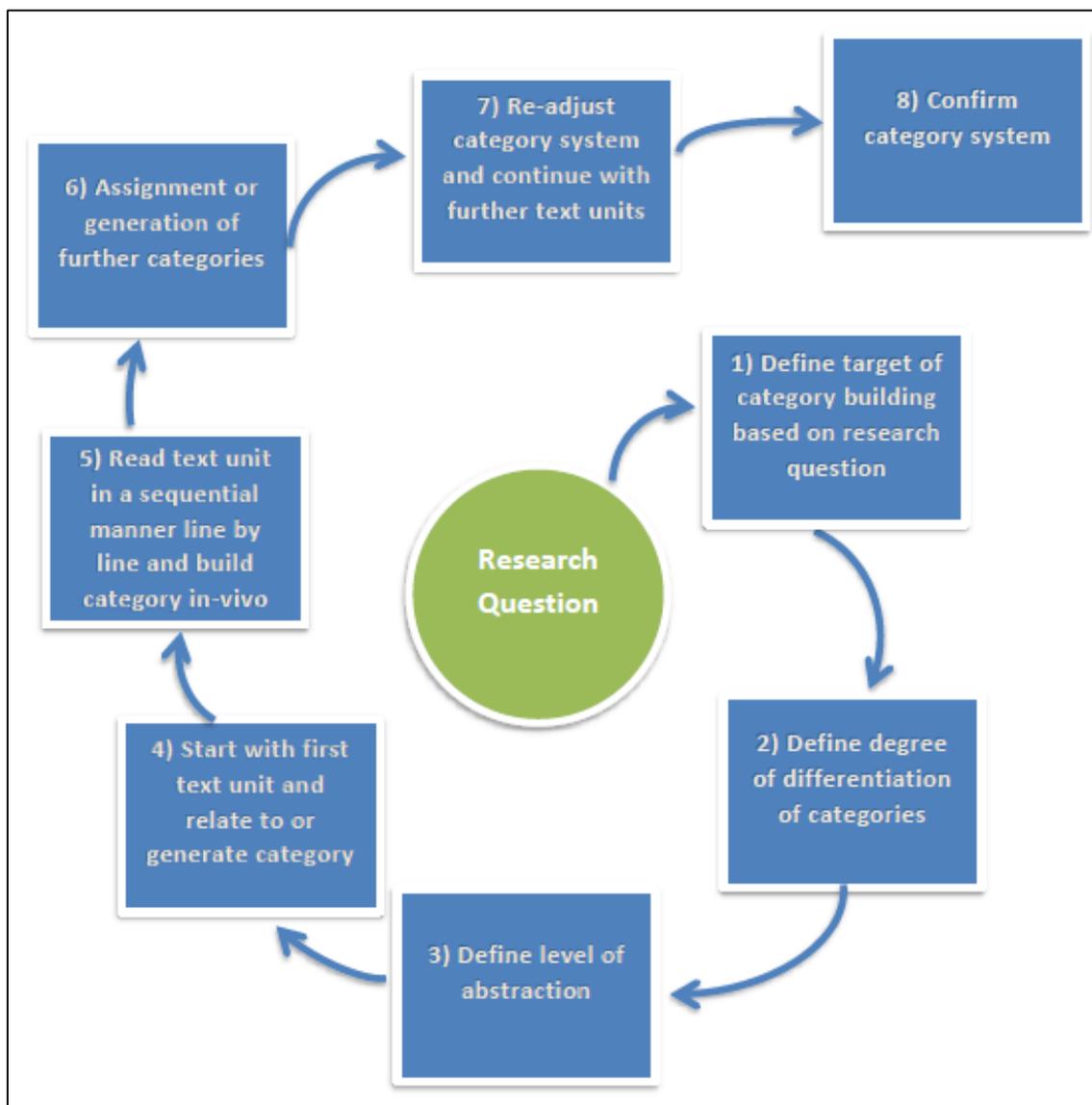


Figure 27: Developing categories from the text (Kuckartz, 2012, p. 64)

By following Kuckartz's eight-step-approach, which was based on Mayring's (2000) earlier work, the author had to initially clarify what should be achieved with the categorization process and for which research question they should provide support. With this in mind, the analytical text process needs to support the research questions. The coding tasks could be divided into two text categories. The first one deals with the perception of independent living and the second with determinants that influence technology use. In the next step, Kuckartz (2012) mentioned that a researcher needs to clarify the level of abstraction. In particular, how close the researcher wants to stay to the original wording of the participants. For this study, a higher level is more appropriate because the focus is on the transparency of the content rather the sticking to original wording, which includes dialects and slang (see also transcript policy).

In a further step, the text unit is marked and at the edge of the document and a category was assigned, which can be a word or a short phrase (e.g., frustration with technology). The research framework incorporates an initial list of coding categories that were used as a starting point. The fifth step of Kuckartz's approach involved working through the documents and assigning a new text unit to the above mentioned initial categories. To ensure consistency each new text assigned was compared to the texts already assigned in the category. Occasionally it was required to assign a text unit to more than one category, which is an accepted procedure according to Kuckartz (2012). Also, relationships between categories like the technological sophistication of a product and the use innovativeness of the participants were examined and the categories were modified. A special emphasis was laid on the anchor examples, which should be characteristic of the category and support the differentiation to other categories and therefore clarify the application of the category and justify the conclusions made. These anchor examples should be seen as the "voice of the customer" (Goffin et al., 2012) and are discussed with the relevant findings from the literature.

#### **Background constructions**

Content analysis suits the philosophical standpoint of social constructivism, but in this research it is not enough because the context plays an important role that cannot be assessed by a pure textual analysis of coding and categorization (Maxwell, 2013). Maxwell (2013) pointed out that categorization as an analytical strategy "can create analytical blinders" (p. 112). To overcome this, the author applied "connecting strategies" (Maxwell, 2013, p. 112) and used various data (memos, transcripts, and photos) to find out 'discourses,' controversies, or debates in the current living situations of the older adults. Thus, the author paid attention to background constructions (Schütze, 2001) in their narrative renderings. The author determined that part of the analytical strategy was to pay particular attention to background constructions (Schütze, 2001), which are self-corrections or justifications of the participants regarding the course of her or his narrative rendering. Schütze (2001) referred to background constructions as a point during the narrative and self-monitoring at which the participant realizes that the course of presentation has become questionable. As these are difficult to code, the author made use of memos and sacrificed validity requirements. In

doing so, the author had a chance to understand the deeper motivations of current attitudes, inner conflicts and implausible behaviour. In this line of thought, the texts were initially analysed for sequences (Schütze, 2001), which are autonomous narrative segments or units. Although connected, any of them is a narrative by itself with the purpose to balance the reductionist character of directed content analysis.

### **3.3.2 Transcript policy**

As mentioned earlier, the author made transcripts of the contextual interviews, expert interviews, and focus groups workshops. To facilitate reading and to set the focus on the content of the transcript, it was necessary to use special transcript policies (Kuckartz et al., 2012). This was especially important for the lively discussions in some parts of the focus group sessions with seven participants per group, which were characterized by the participants speaking simultaneously. The author followed the transcript procedures provided by Dresing and Pehls (2012):

- Slang language and dialects have been translated into standard language
- Breaks and pauses in the interview have been marked with dots
- Positive (like mh, ah-ha) and negative (like hm) answers were written down. Other vocalizations like 'mhm' were not written down
- Special highlighted words and intonations were written down in upper case
- Emotional expressions (e.g., laughing) were mentioned in brackets

### **3.4 Validity and reliability**

This thesis provides a detailed documentation of the major decisions and provides a high transparency of the steps taken to ensure reliability. For the analysis of the primary data, content analysis has been used, which has clear guidelines and procedures (Kuckartz, 2012; Mayring, 2000) and is supported by using a well-established software programme (MAXQDA) providing further transparency on how the raw material has been handled and the categories

were built. Content analysis helps other researchers repeat the analysis procedure as it provides a systematic and transparent approach (Kuckartz, 2012).

The author applied several procedures to ensure validity and reliability. LeCompte and Schensul (2010, p. 193) stated that “triangulation ... is critical to the validity and reliability of ethnographic research.” For the same research question, the author made use of between-method triangulation and compared the primary data produced of the different methods used (Hammersley & Atkinson, 2007). Similar findings emerged from the methods used and enhanced the validity of the findings. Ethnography was chosen because it allows a combination of methods (Hammersley & Atkinson, 2007). As an example: the author becomes a participant observer who can triangulate the interview responses from the contextual interviews with direct observation of the same persons, which reduces the reliance on a single method. Triangulation was one reason why the author preferred doing the interview with a close partner of the interviewee, either the husband or a child. This allowed for the identification of the way somebody describes the partner or mother e.g., as ‘helpful’ or ‘not competent in operating a washing machine’.

For the purpose of triangulation, data was collected over the period of time in consecutive phases from different sources (diaries, photos, face-to-face interviews including observations). The primary data gathered in contextual interviews, were validated or dismissed by the succeeding expert interviews and focus groups. According to Creswell and Miller (2000), a popular strategy is to convene focus groups to review the findings. Both Easterby-Smith et al. (2008) and Saunders et al. (2007) referred to focus groups as group interviews that focus clearly upon a particular issue and that enable intensive discussions. According to Yin (2009), a major purpose of focus groups is to corroborate certain issues that the researcher thinks have been established.

When dealing with older adults, the author had to deal (at least) with two specific validity threats. First, attention had to be paid to the mental and physical condition of the participants, which might result in a loss of attention during the interview process. This was counterbalanced by using short and conventional questions. Second, interviewing older participants about technology use requires sensitivity and empathy to avoid patronizing them.

Due to the small sample size, the author is aware that the external generalization will remain limited. Overall, the reliability and validity of the study have been enhanced by all of the steps taken by the researcher (e.g., between-method triangulation, stakeholder perspectives, reflection-in-action, and content analysis).

### **3.5 Considering research ethics**

The author placed the highest regard to ethical considerations throughout the entire research process. The conduct of the research is guided by the university's code of ethics. The ethical guidelines provided by the University of Gloucestershire *Research Ethics: A Handbook of Principles and Procedures* (2013) were followed throughout the whole process. Furthermore, the research proposal has been submitted to the university's research ethics committee for consultation and approval. The author recruited elderly participants from different life-stages (approx. 65 years or older) from his private network who currently live independently in their homes. There are certain general ethical issues to be considered during research (Saunders et al., 2007): privacy, voluntary nature, and the right to withdraw, consent, confidentiality of data, anonymity, reactions of participants to the way data are collected including embarrassment, stress, harm discomfort, pain, the behaviour and objectivity of the researcher, and the quality of research. Saunders et al. (2007) also stated that research ethics cover the ways in which research is conducted and reported and that additional complex issues such as research bias, quoting other authors, etc. must be considered. As mentioned earlier, the present research methodology is based on a multi-stage approach using 'applied ethnography' as the most important approach. Attention was given to ethical considerations at all stages of the research project when seeking access during data collection and analysis and when reporting that data. The abovementioned ethical issues are of a more general nature and should be considered during the actual research work. However, the author engaged in special activities to address ethical considerations depending on the specific method being applied.

#### **Contextual interviews**

- For the contextual interviews, the older persons sampled were contacted only from the author's personal and private network. They were contacted by telephone in advance and informed about the purpose of the study and the modus operandi was explained.
- It was emphasized that they were welcome to invite another trusted person, a partner or daughter/son, to attend the interview if they so wished.
- General permission was sought to visit their homes by providing written information about the research background and scope.
- Free informed consent of the older adults was assured. They were asked to read and sign consent forms for the home interviews (see Appendix 10). Consent was indicated by signature and was given by all participants. They had the right to refuse and withdraw at any time without giving any reasons.
- The author was accompanied by his wife, who provided assistance in organizational matters (e.g., video recording) during the course of the interview.
- To develop an understanding of each participant's housework related activities and the context in which they live, multiple interviews were carried out in consecutive phases. This allowed one interview to be based on observing the physical environment of the participants.
- In order to be a really good listener, the author asked for permission to tape-record the narrative. Permission was sought for taking pictures of the location of the appliances. In addition, the product demonstration was videotaped with prior permission. All interviews were transcribed verbatim and annotated with observational notes in an anonymous manner. Data storage was made on a personal computer in the author's home office, which is only accessible by the author.

#### **Focus groups**

- In a consecutive research stage, the qualitative approach included focus groups sessions with older participants in a familiar parish building of the community, which provided a comfortable setting.

- The same ethical guidelines were applied. Free informed consent of the elderly was assured. They were asked to read and sign consent forms for the focus groups. Consent was indicated by signature; all participants signed the agreement. They had the right to refuse and withdraw at any time.
- In addition, a representative of the organization was present in all three focus groups.
- The author was accompanied by his wife, who provided assistance in organizational matters.
- An introduction about the topic under investigation was given and the modus operandi explained. Further, the participants were informed that the interview would be recorded on tape, and due to ethical considerations, all personal data would be made anonymous. Permission was sought for taking pictures. In addition, it was explained that they could skip any question or theme or abort the focus group at any time without reason.

#### **Expert interviews with day care workers**

- The author received official permission from a day care organization to interview the day care workers about their activities in the day care centre. No interviews were conducted with older adults.
- The names of the day care organization and the interviewed day care workers were made anonymous. Free informed consent from the day care workers was assured. Consent was indicated by signature, which all did. They had the right to refuse and withdraw at any time during interview.

#### **Expert interviews**

- The author received official permission to contact the members of an organization engaged in voluntary initiatives to support the elderly with technology. The members were contacted in writing about the research scope and informed that they could volunteer in an audiotaped telephone interview if they so wished.

- Free informed consent of the experts was assured. Consent was to participate was provided by return mail. They had the right to refuse and withdraw at any time without reason.
- A focus group session with experts followed the same strict ethical standards.

#### **Data storage**

- The raw data gathered from the interviews and observations were stored in a protected file on the laptop of the author, including photos and video clips. The raw data consisted of audio recording files.
- Only the author was able to open the file with a password.
- The notes made during the interviews and the observations, the information about the observation tasks, and the reflective notes made after the observations consisted only of anonymous data (e.g., “P1” was used instead of the real name of participant).
- All the transcripts were anonymized. The original file with the audio data was deleted. Consequently, the data analysis procedure consisted only of anonymized data.

### 3.6 Chapter summary

The table below finalizes the chapter and includes the methods which are related to the research questions and objectives.

**Table 20: Expansion table**

Research Questions	Source	Literature Review Results	Research Methods (primary data)
How to identify and manage entrepreneurial opportunities for an ageing consumer goods market?	Overall research study	Unclear managerial implications out of disruptive innovation theory (Adner, 2002; Anthony et al., 2008; Christensen; 1997, 2013; Danneels, 2004; Selhofer et al., 2012; Steen, 2013) related to elderly consumers well-being (Herstatt et al., 2011; Kohlbacher et al., 2014; Steen et al., 2011). Throughout the research, the theory of social practices is used, which looks at the elements 'objects', 'skills', and 'images' related to social practices, including domestic chores.	Following a multiple method qualitative approach. Combining attempts of 'applied ethnography,' 'participant observation,' expert interviews, and focus groups.
(1) How are independent living and the influence of household technology perceived by the elderly?	Secondary data and primary qualitative data	Ageing-in-place and independent living as main wish of elderly. Technology as key strategy to support this wish (Gaßner & Conrad, 2010; Mollenkopf et al., 2010). Strong empirical orientation towards 'individuality' and 'autonomy'.	Contextual (home) interviews (incl. usage diaries). Expert interviews with day care workers
(2) What are determinants that affect use patterns of household technology?	Secondary data and primary qualitative data	Various models (e.g., DOI, TAM, ADOPT) neglect a deep insight in different use patterns of older adults. To overcome innovation barriers among older adults, their usage patterns need to be thoroughly analysed, so that innovations may be developed which are compatible with current usage behaviour (Ram & Sheth, 1989). The use diffusion model by Shih and Venkatesh (2004) was modified as an approach to identify different user segments among older adults (persona typology). The synthetic framework assists to identify areas of disruptive innovation to facilitate daily practices (Schatzki et al., 2001; Shove et al., 2012; Warde, 2005) and the job to be done (Christensen & Raynor, 2003; Goffin et al., 2010, 2012) in the domestic domain (Loe, 2015).	Contextual interviews (incl. diaries) and participant observation in the homes (incl. product demonstration and using cultural probes). Expert interviews to validate and enrich findings. Supplemented with focus group discussions of possible solutions. Presentation and joint discussion of user scenarios.
(3) What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?	Secondary data and primary qualitative data	The research posits that different usage patterns "result in different levels of interest in future technology acquisition" (Shih & Venkatesh, 2004, p. 69), either sustaining or disruptive innovations. Disruptive innovation is primarily a business model problem (Christensen & Raynor, 2003; Johnson et al., 2008). ECO and MCO need to co-exist (Chesbrough, 2010).	Focus group with experts using scenario method to discuss conceptual directions and implications for a business model.

## 4 Analysis and discussion

This chapter consists of the findings, the analysis, and a discussion of each of the different research stages. The figure below visualizes the main steps involved in developing the conceptual framework.

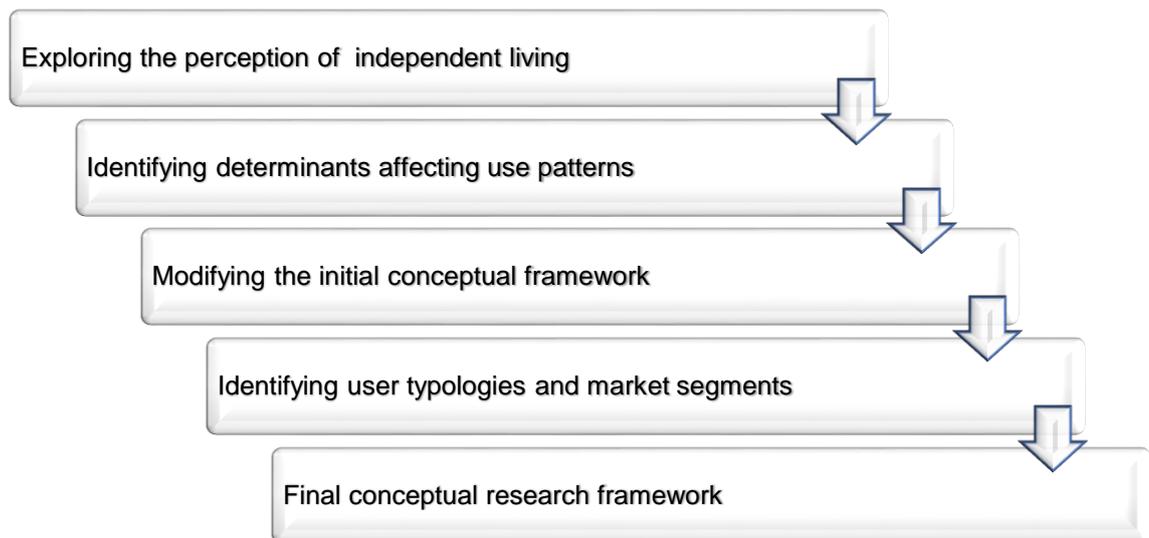


Figure 28: Analytical process

### 4.1 Research stage 1: Exploring independent living and identifying determinants

The aim of the home interviews was to validate and possibly extend the results of the literature review; research questions one and two are addressed in particular. Therefore, the home interviews serve for reducing the bias of the author and make use of the elders' opinions in order to identify the determinants influencing technology use.

#### 4.1.1 Planning, conducting, and analysing contextual interviews and participant observation

As the literature review showed, older adults prefer to spend most of the time in their homes. Thus, it was very surprising that very few works were found that study the problems of the elderly in the domestic domain. The author attempted

to address those methodological gaps by designing an observational and interview-based research study. All participants have to live in their homes independently, that means, without help of care workers. To gain access to the private domain is difficult (Easterby-Smith et al., 2008; Hammersley & Atkinson, 2007; Pink, 2004; Miller, 2010). Therefore, the author used a snowball method of recruiting participants using the network of people that had already been interviewed and that belong to his wider personal network. In total, 13 participants from his personal network were recruited through snowball sampling. Furthermore, a mix of singles and couples was preferred in order to observe the implications of coping with housework alone or in a partnership.

In the *Generali Altersstudie 2013* (Köcher & Bruttel, 2013) and in official statistics old age is conventionally marked by the age of entry of retirement, which in Germany is 65 years. The author adopted this age entry for participant recruitment and further guided the recruiting process to the concept of technological generations as introduced by Sackmann and Weymann (1994). Obviously this relates to chronological age, but it provides a different perspective because to consider “cohort effect or technological generation is a crucial part of understanding their common social contexts and familiarity with particular technologies” (Loe, 2015, p. 3). Thus, for the sampling and recruitment strategy the author focussed on participants who belonged to different cohorts, particularly to the two technological generations:

- Early technological generation: born before 1939
- Generation of household revolution: born 1939 – 1948

Following this approach meant recruiting participants aged 65 years or older to distinguish possible cohort effects between the two technological generations. In one isolate case, the author lowered the threshold. This seemed to be acceptable because no distinctive boundary exists from one year to another with regard to changing attitudes and behaviours.

### **The sample structure**

The conduction of the home interviews was in the German language and carried out between August 2013 and March 2014. The interviews were planned to be conducted in two sessions. The author personally conducted all

home visits. In almost all of the cases, the author was accompanied by his wife for technical and organizational support. Most participants were visited twice as planned; two participants were visited three times due to unresolved issues. In only three cases, was a single interview possible due to the participant's availability and the travel distance to the location. In total, 13 participants took part in the interviews, which resulted in 25 visits. Most participants were assisted during the sessions of interviews, mainly by their partners or children. The presence of those individuals was appreciated not only for ethical considerations (see also research ethics in 3.6), but also because their views occasionally contradicted those of the participants and were included in the study (Pink, 2004) for the purpose of triangulation. The duration of the visits varied from approx. 60 minutes to two hours depending on the process length of product demonstration. All participants (except P5) were retired from employment. The recruited participants were aged between 63 and 78 years. The participating husbands were approx. 3 to 5 years older than the wives; the oldest was close to 80 years (husband of P11). Thus, experiences from different technological generations were covered. The participants had previously worked as housewives, engineers, secretaries, skilled workers, police officers, doctors, and teachers, which provided a good mix of different professional and educational backgrounds. All participants can be broadly described as belonging to the middle and upper class. Clearly, this is a limitation and narrows the research scope, as the severely marginalized elderly were not represented due to ethical considerations.

## 4 ANALYSIS AND DISCUSSION

**Table 21: Overview of participants (home visits)**

Participant	Gender	Age	Profession	Living Situation		Additional Participant	Available Appliances		Location of Appliances
							Washer	Dryer	
P1	Male	69	Skilled worker	House with garden	Couple	None	X	-	Cellar
P2	Female	67	Housewife	House with garden	Single	Son	X	X	Cellar
P3	Female	78	Housewife	House with garden	Couple	None	X	-	Cellar
P4	Female	70	Secretary	House with garden	Couple	Partner	X	-	Cellar
P5	Female	67	Consultant	House with garden	Couple	None	X	X	Cellar
P6	Female	71	Housewife	House with garden	4 persons	Daughter	X	-	Cellar
P7	Male	72	Doctor	House with garden	Couple	Wife	X	X	Cellar
P8	Female	69	Teacher	House with garden	Couple	None	X	-	Cellar
P9	Male	63	Engineer	Flat	Couple	Wife	X	X	Cellar
P10	Female	72	Secretary	House with garden	Couple	Husband	X	X	Cellar
P11	Female	71	Housewife	House with garden	Couple	Husband	X	-	Cellar
P12	Female	69	Housewife	House with garden	Couple	Husband	X	X	Cellar
P13	Female	75	Teacher	House with garden	Single	None	X	X	Cellar
<b>Total</b>		<b>Average</b>					<b>Total</b>	<b>Total</b>	
<b>13</b>		<b>70</b>					<b>13</b>	<b>7</b>	

The data gained by home interviews are displayed as Px for participant whereby the 'x' is the number of the participant recruited for the home visits.

### **The interview process**

The topic interview guide (see Appendix 8) is structured in three parts (general entry/warm-up, domestic activities and perception of future life-style). These three parts are related to issues of independent living and the determinants and sub-determinants from the initial framework. For each theme/determinant the interview questions start with one 'general question' to stimulate free narration and thereof derive a range of related 'specific inquiries.' As an example, to explore issues related to the personal dimension a 'general question' about the weekly shopping habits was asked, such as "when you go shopping on the weekends, what is important to consider?" to stimulate narratives about independent living and domestic practices. From here, more detailed aspects of the personal dimension were addressed, such as life course changes after retirement, aspects of quality of life, the meaning of ageing, perception of the current (physical) living situation, and the like. In a next phase, domestic practices were discussed in more general terms, including organization, planning, and assistance in doing the household tasks. In this stage, an evaluation of perceived changes in doing the practices over the years was addressed. This involved narratives about the segregation of domestic practices, employment of a domestic helper, and the perceived usefulness and role of household appliances to facilitate tasks. Concerning the technological dimension a general question was raised like "for yourself, what would make life easier?" and more specific technology related inquiries like "how do you evaluate your technical abilities?" Due to the rapid development of smart technologies and their application in the domestic domain, the perceived benefit of computers, the Internet, and smart phones was attended to explore the use innovativeness (Shih & Venkatesh, 2004) of participants and to see if participants were accustomed to innovative, smart technologies (a more detailed description of interview questions related to the determinants can be found in the Appendix 8). In the following, more detailed inquiries related to product characteristics of washing machines were raised, such as likes/dislikes of features, aspects user convenience, quality, and operating costs.

Third, the interviewee was asked to verbally report and describe the practice and the related elements in doing the laundry. Also, the level of satisfaction with the process and the appliance were discussed. For this study, applied

ethnography offered an 'insider' perspective through home visits, so that detailed understandings could be gained from observing older adults' realities. As pointed out earlier, when an ethnographer is in the field making observations, it is important to remember that it is a motivated observation (Kelly & Gibbons, 2008). Contextual, problem-centred interviews could guide finding disruptive innovations that are grounded in how people are living (Kumar & Whitney, 2007). The author was interested in the actual practice, the work-arounds, the 'embodiment' (Lai et al., 2008), and the challenges that occur in following the laundry tour (Pink, 2012). Therefore, with each participant the process from collecting the laundry to the drying task was 'enacted' (Pink, 2012). This activity was announced and agreed to in advance during the recruitment phase; therefore, the participants were prepared to demonstrate the process activities involved. In a final step, stimulus material was presented in the form of a prepared shirt with stains. The interviewee was asked about the strategies to get rid of the stain and then asked to attempt to do so prior to the following session. Here, the aim was to deconstruct the practice in process activities to identify how the elements are linked. Finally, the first interview ended with an inquiry how and where they hoped to live in 10 to 15 years. They were also asked to predict how they would accomplish household tasks at that time.

The second session allowed for the clarification of questions and the possibility to gather deeper responses to open unresolved issues related to independent living and determinants. The main purpose was a 'deconstruction exercise' to talk about skills, objects, and images in doing the laundry and revolved around the strategies involved to remove the stains from the shirt. After discussing the outcome, an additional stimulus material in form of a new detergent format was presented. The perceived usefulness was discussed, in particular in how far this new element might be integrated in the process to support and increase the performance of removing stains.

### **Analysis of interviews**

The analysis of the interviews started with the documentation of field notes directly after the interview took place. Furthermore, transcriptions of the interviews were prepared and analysed together with the field notes by focusing on the meaning and sense of the answers with respect to the initial predefined

category scheme as outlined in the initial research framework. Each qualitative content analysis followed the same procedure (Kuckartz, 2012; Mayring, 2000; Mayring & Fenzl, 2014). First, the author took down field notes directly after the interview on a prepared form and recorded the general impressions about the site, the location of the washing machine, key comments of the interviewee about ageing, independent living, and the practice of doing the laundry. Also the personal feelings of the author during the interview were taken down. The photos from the living environment, particularly the location of washing machine appliance (see photographs provided in Appendix 1), and the video of the practice demonstration recorded were saved in a separate file. Second, the audiotaped interviews were transcribed and a manual analysis was done (see transcript examples provided in Appendices 9, 12, and 14). The manual analysis was aimed at getting a first understanding of the content by applying sequential analysis. In a next step, the pre-defined category scheme from the initial research framework was applied. Furthermore, comments and short memos were added in order to possibly validate and expand the initial set of categories. Third, the analysis was done via MAXQDA. Short memos were assigned to all interviews briefly describing the main findings. The findings consist of coded interview segments and the profile matrix (see Appendix 5) together with the field notes, which build the starting point for the analysis and discussion of the qualitative data (Kuckartz, 2012).

### **4.1.2 Perception of independent living**

By following an outcome driven innovation approach (Bettencourt & Ulwick, 2008), the first research question (RQ1) is related to the ‘outcome,’ the support of an independent living. With this in mind, the study explores the question: **How are independent living and the influence of household technology perceived by the elderly?** If the answer to the first question leads to the conclusion that independent living is significant for the well-being of the elderly and can be regarded as a social need, then the context of independent living needs to be explored. Thus, it is necessary to understand the role that household technology can play as a means to support and facilitate independent living because “Personal independence depends on the ability of seniors to perform instrumental activities of daily living (IADL)” (Higgins &

Glasgow, 2012, p. 333). Shifting the attention from the individual to practices offers the potential of exploring the role of habits, routines, and conventions. This perspective questions and challenges the view of many scholars that central to independent living is the recognition that each individual has control over his life, based on the ability and opportunity to make free choices (Gaßner & Conrad, 2010; Malanowski et al., 2008).

### **(1) Reflections and experiences of home visits**

#### **Disruptions in later life**

Transitions that occur later in life are typically difficult when talking about retiring (P7, P8, P11), the loss of a partner (P2, P4), or sudden dependency due to health issues (partner of P7). Those changes were described as very disruptive and disorienting. For a retired doctor (P7), the transition into retirement was not easy and required a reorientation. Today, the newly gained freedom opens possibilities to enjoy home:

*“I can enjoy my home more... I used to work 60-80 hours a week, sometimes even more...” (P7)*

The reorientation was not easy and caused ‘big holes,’ but now he does volunteer service. He does this with great enthusiasm, because it is close to his heart. Because of this work he never feels unneeded or useless.

Volunteer work plays a big role for him:

*“Why shouldn’t I pass my knowledge to others? Yes, this is important for me, because I don’t feel empty and useless.” (P7)*

#### **Feeling younger**

The primary data findings underline that every ageing story is different (Köcher & Bruttel, 2013). The way that ageing is perceived and when old age begins can also vary. This has implications for distinct marketing and advertising requirements because age perceptions of older adults are typically 8 to 12 years below their chronological age and there is strong identification with persons that much younger (Kohlbacher & Hang, 2011; Wolfe & Snyder, 2003). As one of the participants (P4) vehemently stated: *“What kind of an age do we have? What about 70? That’s nothing.”* Many found their body as somehow old.

However, the ‘inner self’ was regarded as much younger. As an example, a socially active 69-year-old man (P1) mentioned that he feels 10 years younger.

*“So I do not feel as old as I am at all, you know. I guess I am still around 60, you see. But, when it comes to some relapses, you know, at housework, you recognize that you are not able to do everything with your hands tied. All of a sudden. You can tell by certain activities.” (P1)*

Several studies pointed out that older people feel younger than their chronological age and that this perception affects consumption behaviour (Amatulli, Gianluigi, & Natarajan, 2015; Kohlbacher & Chéron, 2012). This deviation of ‘chronological age’ and ‘inner age’ (or cognitive age) manifests the positive assessment of independent living in old age by the participants. This quote underlines that to feel 10 years younger has become a central cultural ideal (Twigg, 2014). As this quotation reveals, this perception has far reaching implications to overcome image barriers because “People do not willingly buy products ...that are in conflict with their self-image” (Wolfe & Snyder, 2003, p. 200). With regard to asking the participants where and how they want to live in 10 to 15 years, all participants emphasized the wish to stay in their homes for as long as possible:

*“Where am I going to live? Here. We are going to be 90, over 90, you know. In 10 years I am, we will still be here... When the spirit is still there. That’s it. I think physically, if that doesn’t work anymore, you can get help. But if there is something wrong mentally, then you have to say goodbye to this here.” (P4)*

### **Attachment to home**

The emotional attachment to the particular home was strongly expressed by all participants (P4: *“I love this house”*). This seems to be especially true for the homes of the elderly, which are full of significance on entering the door. In every corner and on every wall, there are symbols of family life and the current situation of a person. Usually all participants had pictures on their wall of children, grandchildren, relatives, or dead spouses. Stories of the past were ubiquitous and showed images of younger days, when the home was a different place - a place of interaction and plenty of housework and laundry to do. In this sense, home can also be the collection of stories (Shove et al., 2012; Massey, 2005) about health decline in later life and the growing difficulties in doing

housework. However, some participants (P4, P5, P7, P10) also cautioned that staying in one place is not necessarily a good thing due to the workload involved for the upkeep of the house and the garden. With the departure of the children, almost all of the participants find themselves in large family homes with more space than they require. Pink (2004) conceptualized the home as a necessarily 'incomplete project.' However, for all of the participants in this study, nobody expressed plans for renovations that needed to be done. In contrast to Pink's (2004) assertion, the home of the elderly was a 'completed project.' However, becoming attached to the home can limit a person's ability and willingness to move to a more appropriate, smaller, living environment when health issues make it necessary. Some of the participants live in rural areas, which means that growing older in their homes can result in a lack of services and leisure amenities (P6).

### **Independent living as a multidimensional construct**

*"For all the mentioned activities so much life time is wasted!"* One elderly lady (P13), a retired teacher in her mid-70's, made this statement in her diary about doing the laundry and other housework tasks. It seems to be common understanding that staying in one's home for as long as possible is one of the main wishes of older adults. When the participants were asked about going to a day care centre, the emotional reaction of one 70-year-old woman (P4) was enraged and very clear:

*"That sucks! Yes, that is terrible. Sheltered housing or just being taken into a residential home, which is just hard, because there you are always told what you should do. They tell you when you have to have your breakfast, you are showered or bathed, no matter what. I just hope that we don't have to go through that. That maybe, when we are 90, we will come back from the Caribbean and our plane will crash, you see?" (P4)*

However, the primary data showed that independence or independent living is a rather complex, multidimensional construct lacking a consistent definition. One possibility is provided by scholars from gerontechnology (Loe, 2015; Wahl et al., 2012) who defined independence as one's capabilities to care for oneself in every day tasks without external help ('Alltagstauglichkeit'). In such thinking, a main reason for the transfer of older adults to care centres is seen as being due

to problems of coping with 'Instrumental Activities of Daily Living' (IADL) like cooking or doing the laundry.

### **Independence and social inclusion**

During the conversations the author raised aspects of following a life-style of independent living and addressed the complete opposite concept of dependency. Daughters, sons, neighbours, friends, etc. each have their stake. Particularly, it requires a critical discussion about the "older-people-want-to-live-at-home" mantra (Peine et al., 2015, p. 4) and the role that technology plays. Many scholars agree that technology plays an important role for independent living. A 70-year-old retired teacher (P8) underlined the social aspects of sharing tasks. Embedded in that approach were moral arguments about what is important in life (P8):

*"Ok, Ok. It can also be the other way round and that is a big, big danger for me. So for me, the concern for one another is important. Also to live together with more generations. That they get along with each other, care for each other, that you do not get rid of a person, that you have time for each other and I think, this brings more quality then. ... well, apart from vacuum cleaners that move around the edges alone." (Laugh) (P8)*

Against this background, an "overly instrumental view on technological innovation" (Peine et al., 2015, p. 2) needs to be reconsidered. The daughter of an older woman (P6), a single mother of an adult son and daughter, who lives in the house of her retired parents, strongly underlined "*I would never give my parents into a residential home, if it didn't have to be. I wouldn't do that.*" Caring for each other and independence is a rather multidimensional issue and also generates controversial discussions within a partnership when it comes to taking over housework tasks. An older woman (wife of P7), who was recovering from a recent accident, was opposed to her partner's well-intended assistance because she feared losing her self-sufficiency in her household. She maintained that position even though those activities were exhausting and more time consuming. From a social practice-based perspective, her partner's support can be seen as problematizing the links between images, skills, and objects. Despite all of the harmony, restrictions are imposed on her by her husband. The author triggered a controversial discussion about changing practices after the

husband (P7) retired. His good intention to support her due to her health situation affects her daily routines.

*He (P7) "My wife tells me: 'You always take away everything from me!'"*

*She (partner of P7) "Well, this is what you do... You cook for me; you took over all the things which usually used to be my tasks."*

*He (P7) "That is the famous kraken in me, as you always say. But I take away her work because I know about the risks accompanying it."*

### **Segregation of housework**

When it comes to mundane housework tasks like doing the laundry it can be confirmed that gender differences exist for couples from both technological generations. In particular, doing the laundry remains the domain of the women (Shehan & Moras, 2006). As an example, a 67-year-old woman (P5), who is still working as a financial consultant, reported about the lack of interest by her husband in doing the wash.

*"...he just has no eye for that...., he only does it when I tell him to do it. Finally, he does it. But when I think that he must be able to see it, he doesn't do it, because he doesn't see it..." (P5)*

Concerning couples, the primary data presents a clear picture about gender roles and the responsibilities of housework task. For the couples, the participants organized their homes based on traditional gender role segregation. The men would not engage with 'housewifely' practices on a daily basis and do not possess the knowledge to operate the machine as the following statement underlines:

*"My husband doesn't do anything in the household. He still works. He still works full-time. At nearly 75. And still on the road." (P8)*

### **'Lazy men'**

It seems elderly men lack interest in getting too deeply involved in well-ordered domestic routines that have been established for many decades and the required household technology. During an interview with a couple (P11) the husband, who is almost 80 years old and a very active, athletic person, is fiercely opposed to new technologies. Smartphones and computers are

something for a different much younger generation. He seems to be determined to stay indifferent even to the simplest mobile technologies: *“And he doesn’t use the mobile, because he can’t cope with it”* (P11). The same applies to using the washing machine.

*He (husband of P11): “I can’t use the washing machine.”*  
*She (P11) added: “Men are always a bit more helpless” (laughs)*

He knows only little about washing clothes and ironing, and rejects taking over the housewife’s role. The primary data confirm the literature findings; elderly men reject taking over the role of housewife (Pink, 2004) and that doing the laundry is the ‘women’s place’ (Shehan & Moras, 2006). In general, the couples prefer to stick with their learned conventions, habits, and routines. That paradigm affects different use patterns because typically women are more familiar with operating the household appliances. However, in the dialogue with this couple (P11), it seems like their well-ordered domestic segregation and harmony is undermined by her silent curiosity and hidden affection towards smartphone and computer: *“He doesn’t use the computer..., I often play....”* (P11). She enjoys to gamble skat on her computer and is eager to learn more about the usage of computers.

As the sampling was done according to the technological generation, it can be assumed that the lack of experience with household technology in the formative period of men is a determinant affecting usage patterns. During the interviews, it was revealed that the women usually do the housework inside the house; the men are more involved in garden work or financial issues. One male participant (P9), a retired engineer, mentioned that he is more involved in strategic operations and his wife in follow-up activities including housework, to him: *“I am a decorative accessory”* (P9). Typically elderly men are not involved in housework at all or have special tasks outside of the house in the garden. As one male participant mentioned about his role (husband of P10): *“Everybody has his or her likes.... That is the reason why she is responsible for the house and I am responsible for the gardening.”*

### **“Late freedom”**

The term “late freedom” (Kruse, 2013a, p. 63) seems to be an appropriate description of the positive life situation of many participants. As an example, a

retired 69-year-old civil servant sees the gained “late freedom” and the social security as important elements for his well-being:

*“Security is social security, the pension and so on and then the freedom which you didn’t have in your working life. That you get up in the morning and tell yourself: Let’s call it a day! So that you can arrange your day for yourself. No work pressure anymore. So that you can really enjoy it.” (P1)*

By stepping into the intimate context of a domestic world of the elderly, the author became involved in narratives, practices, and sensory experiences that are usually unavailable for public view. Nowadays, for most of the participants whether they live alone or as couples, the same place has transferred in something else and has new, different meaning (*“I can enjoy my home more”*, P7). First, by treating home as a mere physical space and ‘older people’ as a homogenous group, an inadequate recognition of diverse needs could occur. For some participants, their homes were bound up with transitions in their life stages, some of which were obviously difficult and painful. Second, ageing-in-place is seen as the ideal housing option for those in the Third Age by a number of policy makers and institutions. However, the actual living environment could also be a challenge. Moving down steep staircases with a full basket of laundry is just one of it. Third, in most cases, the elderly have been in their homes for decades. The acquired objects over their life time define the physical home and provide a rather rigid structure in which domestic practices are embedded. All participants felt that it was important to stay in their homes for as long as possible. Their homes represented a sense of familiarity and security. To have “freedom” and “flexibility” in one’s life was an important theme in the interviews, of not being restricted, controlled by others, and to fulfil dreams even in later life: *“I still have my dreams”* (P9) and *“I have always wishes and plans.”* (P11). These statements among others clearly indicated that, without neglecting the obvious challenges, later life it is not a state of ‘meaninglessness and despair.’

### **(2) Expert interviews with day care workers**

As found in the literature, it is common sense that older adults want to stay in their homes and that day care centres are seen as the last possible option (Dörner, 2007; Kruse et al., 2012; Mollenkopf et al., 2010; Rentsch, Zimmermann, & Kruse, 2013). A retired housewife (P4) feared to be “taken into

*a residential home, which is just hard, because there you are always told what you should do*" (P4). This "older-people-want-to-live-at-home" mantra (Peine et al., 2015, p. 4) needed to be better understood. Therefore, the author visited a day care centre to get more familiar with this 'unknown dystopia,' which obviously everybody from the participants tries to avoid.

### **The approach**

From the beginning it was clear that walking around with an interview or observation checklist through the resort would make the author feel awkward toward the inhabitants and the day care workers, as if he was assessing the resort and their practices. This was not intended. The author preferred to observe the resort, as the place in which practices occur, in a more open-minded way without a predefined checklist. The encounters and the interaction were organized in a more open way and were characterized more like a conversation or a dialogue.

The organization agreed and welcomed the approach of 'silent observer.' Due to ethical considerations, it was agreed that no official interviews would be conducted with the elderly. An indirect approach was followed (Pink, 2009) by understanding the circumstances and work of the day care workers and the context in which they worked. The attempt followed what Pink (2009) termed "sensory ethnography," or seeking non-verbal ways to understand and communicate about the experiential dimensions of the phenomena, while also examining how verbal categories are used by people to classify and communicate about these experiences. The author visited a day care centre and talked to two day care workers who visit older adults in their homes. During their narratives about their daily practices they informed about very narrow living spaces, filled with 'stuff,' which was obviously collected over the individual's life span. Both day care workers mentioned that older people usually have 'older appliances and furniture.' The author recorded the following in the field notes: "*It seems, older adults refuse to buy new furniture or household appliances at a certain stage.*" The comment underlines that any product development targeted at elderly users to facilitate independent living has to start with a diligent clarification of the living arrangements (Gomez, 2015; Heinze, 2013). In many cases an integration of new technologies in practices seems to be far from realistic because places are "spatio-temporal events" with a quality of

“throwntogetherness” of things (Massey, 2005, p. 130). The “domestication” (Peine & Neven, 2011) of autonomy-enabling innovations (Herstatt et al., 2011) like a vacuum cleaner robot, as suggested by gerontologist, is hardly achievable when the home environment does not allow a free movement on the floor. The day care worker mentioned that in some cases the elderly had ‘mobility frames,’ which were obviously too bulky to manoeuvre freely and need cautious use in some of the rooms: *“The day care workers had to climb up steep stairs, even for them hardly accessible”* (field note). Furthermore, they mentioned that a lot of older persons do not have much to do anymore because they live alone, away from children and are without or have only a few contacts to neighbours. The visit of the day care worker in the morning and in the evening, although very short, has a special importance to them; sometimes it is the only social contact of a day and helps to structure the day. The author wrote the following in the field notes: *“Daily routine is structured mostly by the visits of the day care worker. It is not just stone cold, medical treatment, but personal address.”* The day care workers mentioned the problem of loneliness which caught the author’s attention. He was told about elderly women, who waited the whole day for the day care worker to come to provide treatment and to chat. The author recorded the following in the field notes:

*“Older women are mostly alone; there are some cases where older adults nearly unable to move live on the 3rd or 4th floor, in a house without a lift. They are basically imprisoned in their flats, if there was no day care worker to come to help.”* (field note)

Some scholars feel that the “public sphere needs to support the family” (Nussbaum, 2011, p. 151) and that care and support services have to take over what families and relatives accomplished in the past (Mollenkopf et al., 2010). Talking to a day care worker after 18 home visits, pressured by time constraints and rather nasty driving conditions, this seemed hardly feasible to the author. During the talks with the day care workers, they explained that the visited older adults are called ‘clients’ in order to avoid the term ‘patient.’ This word has another connotation; it combines a social engagement with a business relationship. They discussed to what extent the visited ‘clients’ are the right target group for ‘smart homes’ as most of them are living alone and have health problems. However, the opinion was shared that the context of living tells a different story: the worn-out condition of the furniture, out-dated appliances in

the kitchen; no obvious signs of home renovation to make mobility easier, no laptops or smartphones on the table. The impression grew that the implementation of the concept of 'smart homes' is far from a realistic scenario in most living situations.

The author appreciated the friendly, caring atmosphere in this organization, but it also reminded him of being different, of 'me and 'them.' The author experienced that the reality of fieldwork itself is chaotic, unpredictable, and always beyond the full control of the fieldworker (van Maanen, 2010). A sign next to the deaconry office made the author reflect on the meaning of home.

*"Next to the office door at the deaconry hangs a proverb "Where do we go – always home" (Novalis). Beneath this proverb somebody has parked his wheelchair" (field note)*

The other day, the day workers told the author that one of the women gave her brand new washing machine to her daughter because she was now living in a day care centre. It was initially not clear to the author that this act was not a long planned activity, but rather a disruptive transition from independent to dependent living, which received significance in a later research stage.

To sum up, the contextual interviews in the homes of the elderly showed how some of the participants struggled to reproduce practices in later life and to establish continuity. Despite of that, they all expressed the common wish to stay in the familiar surroundings for as long as possible. However, the discussions with the two day care workers provided a more sophisticated understanding of independent living and showed the author that in some cases alternative forms of ageing seem to be more appropriate than staying 'independently' at home. Against this background, it became clear that the home does not only contain a strong emotional bond, but also a rigid structure where social life is embedded. To Feldmann and Orlikowski (2011, p. 5), "it is not just that recurrent actions constitute structures, but that the enacted structures also constitute the ongoing actions." This structure can provide security and stability, but can also lead to social isolation. As such, the taken for granted assumption that underpins the liberal view of independent living and autonomy needs to be questioned. In particular, that it benefits older adults to be free or liberated from any dependency.

**Table 22: Perception of independent living**

Perception of independent living	<i>"I love this house" (P4)</i>
	<i>"To care for each other" (P8)</i>
	<i>"The freedom which you didn't have in your working life" (P1)</i>
	<i>"I can enjoy my home more ..." (P7)</i>
	<i>"I still have dreams" (P9)</i>

### 4.1.3 Identifying usage patterns

Many scholars (Coughlin et al., 2007; Czaja , 2005; Gaßner & Conrad, 2010; Mitzner et al., 2010; Mollenkopf et al., 2010) have underscored the key role of technology in enhancing the quality of life and independence by improving an individual's ability to perform a variety of tasks and the ability to access information and services. In this section, the author analyses and discusses the primary data gathered during the contextual interviews and observations. The second research question is designed to identify the determinants that affect the usage patterns of household technology and the relative importance of each determinant (RQ2): **What are determinants that affect use patterns of household technology?**

The results provide a refinement and extension of the initial determinants that were based on the model rendered by Shih and Venkatesh (2004), which are described in the following subsection.

### 4.1.4 Household social context

The innovation literature recognizes the importance of the context of use as a key aspect for innovation and technology acceptance (Bettencourt & Ulwick, 2008; Chipchase & Steinhardt, 2013; Goffin & Mitchell, 2010; Norman, 2013). Considering 'context of use' goes beyond attitude approaches in the field of behaviour change. The household social context consists of three determinants from the original framework: Household communication, competition for limited

resources, and prior experience with technology, all of which will be explored in-depth.

The following table displays a summary of the number of participants that confirmed (x) or did not confirm (o) the influence of a specific determinant on the usage of a household appliance. From the table, it is obvious that both household communication and prior experience with technology are important determinants affecting usage patterns. Communication with peers plays a key role in understanding the participants' propensity toward using new technologies. However, a more nuanced understanding is required.

Table 23: Participant feedback (based on Shih & Venkatesh, 2004)

Household social context	Determinant	Description	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	
	Household communication	High communication intensity														
		User can discuss with others	+	+	+	+	+	+	+	+	+	+	0	+	+	+
		Word of mouth														
Competition for limited resources	Limited access to appliances by user															
	Competition for appliance among users	0	0	0	0	0	+	0	0	0	0	0	0	0	0	
Prior experience with technology	Appliances been used for a long time															
	Age of appliances	+	+	+	+	+	+	0	0	+	+	+	+	0	+	
	Familiarity with appliances															

### 4.1.4.1 Household communication

The determinant household communication was discovered during the systematic literature review and was part of the use diffusion model of Shih and Venkatesh (2004). The home interviews confirmed that communication is central to usage behaviour.

#### Validation and expansion

It is not the mere existence of communication that is influential in its role as applied to rate of use and variety. Other influences include: the degree of novelty of a product, its usage implications, and its integration into a practice (Shih & Venkatesh, 2004). When the elderly user can discuss questions with others, particularly more knowledgeable users, information can be exchanged that assists in overcoming difficulties. All participants had people who use computers and smart phones among their peers. As an example, one 70-year-old woman (P8) mentioned her first experience with a smartphone: *“I MADE MY HUSBAND SHOW IT TO ME, but as I said, I am quite afraid of these highly technical devices.”* (P8) Household communication about operating the washing machine and the ‘variety of use’ can also take place in written form. One participant (P5) wrote down instructions on how to use the washing machine for her inexperienced husband or talked on the phone when she was away for a longer period of time: *“... I went for a cure several times and some times I was in hospital and when I could plan it, I wrote down everything on a large A4-sized paper. And there was the telephone, too.”* (P5) When her husband was unable to resolve the interaction with the machine alone, he phoned her for instructions regarding ‘variety of use’ including the temperature selection, detergent dosing, and others issues (P5). However, after her return he no longer seemed to be interested in getting overly involved in household technology.

*“... then he phoned me: ‘I have done this and that, how do I do it best?’ Then I just told him: ‘You select the temperature there, then the washing powder.’ There is not much selection in my household. I just have something for whites and coloureds, well surely something for woollen... I had to give him some instructions about the amount. Funnily.... I went for a cure for six weeks and then he did it and it worked well, but if I am at home, it doesn’t work at all.”* (P5)

Concerning housework, several women described their husbands as 'helping,' but not competent. However, the husband often become involved when family conventions are not followed e.g., when a familiar product is used too often. Especially when this results in high energy or water consumption costs, as the dialogue between a couple showed (P11):

*He (husband of P11): "We wash too often. She washes much too often. (laughs)"*

*She (P11): "But I don't wash too often!"*

Those comments underline the "social and power relations involved in practices" (Hargreaves, 2011, p. 96). Controversial discussions arise about the need for replacement and financial investment and even might require the consultation of third person, like the son, who is trustworthy and knowledgeable (P2).

*She (P2): "My husband didn't want to, right? Oh, there we had a lot of trouble. For heaven sake."*

*Son: "No... really, you had a row?"*

*She (P2): "We just spoke on the phone and he didn't think that it was necessary..."*

*Son: "Well, yes, it is possibly not really necessary... but..."*

*She (P2): "But I said, I want to buy the oven I like, right? Well, afterwards it was alright, see? That was okay then. But he didn't want to. He was of the opinion that it was too expensive, that it was not necessary... I said, I want to have it because of this and that reason."*

(P2)

To sum up, at times the elderly participants needed a knowledgeable person to whom they could speak to about existing, familiar technologies and new technologies. Thus, the determinant household communication affecting technology use can be confirmed. The primary data finding confirmed that household communication influences both the 'rate of use' and the 'variety of use'. Two types of support related to technology use emerged out of the interviews.

- First, the primary data indicated the high significance of *inter-generational* relationships (P2, P12). It was the children that encouraged the parents to adopt and use new or existing technologies.
- Second, the idea of *intra-generational* relationships (P5, P8, P11). Some of the participants reported that they overcome the situation because they had their partner or somebody else around their age to help, which led to using the appliance more regularly.

### 4.1.4.2 Competition for limited resources

The determinant competition for limited resources is part of the use diffusion model of Shih and Venkatesh (2004) as was explained earlier in the chapter. To them, competition for resources implies access to technology and access is limited by the amount of time a person can spend with the technology. “Tensions arise because of possible claims to resources that are not available to all members of a social network at all times” (Shih & Venkatesh, 2004, p. 61).

#### Validation and expansion

For household appliances like a washing machine or dryer, the home interviews showed that competition for limited resources is not central to usage behaviour. Usually, the older women are responsible for the laundry. Thus, nobody else is competing to operate the machines. In contrast, the aspect of collaboration and sharing of technology and practices arises from the primary data. A general concern was raised during the home interviews related to small wash loads. Participants (P2, P3, P4, P8, P10, and P13) reported about their hesitation or their unwillingness to start operating the appliance when they do not have enough laundry to wash. That perception affected ‘rate of use’. On one hand, this would require a technology solution by the manufacturer to develop more ‘adaptable’ machines that would allow single items to be washed without wasting energy and water. On the other side, it could be overcome by sharing the appliance. A single mother of two adult children (daughter of P6), who lives with her 74-year-old mother mentioned that occasionally they “*wash together for economic reasons,*” although both have their own washing machine:

*"But sometimes we also do the laundry together. If I just have two, three pieces, I always ask mom: 'Do you have something?', and then we can load up the machine together." (daughter of P6)*

To sum up, the participants lived mainly in two-person households. In the elderly households, no family member is competing for limited resources. As a consequence, the determinant competing for limited resources will be eliminated from further consideration.

### **4.1.4.3 Prior experience with technology in the family**

Shih and Venkatesh (2004) underscored that updating of users' knowledge might be a relevant variable in predicting use patterns.

#### **Validation and expansion**

The participants of the interviews all had a rather long experience with washing machines. Usually, the acquisition of the first washing machine had a rather high significance for most of the participants, as this was a sign of 'independence' from their parents' home and a symbol of increasing wealth during the post-war period. As a matter of fact, almost all participants were able to recall the exact date that they purchased their first washing machine, even after fifty years, indicating its social significance. As an example, a 69-year-old man reminisced about the first time he used a washing machine: *"But the first washing machine I got was in 1967. ... there I actually got to know a lot from my mother-in-law."* (P1) A 67-year-old woman (P5) told the story how her upbringing and her experiences with housework in her formative period shaped her attitude towards housework today:

*"... well it is definitely a matter of education. Yes, I know that. My mother tended to go to extremes. It already got on my nerves when I was a child. Then all the upholstered furniture was taken outside, with a beater and all the carpets on a line and she did that once, twice... spring-cleaning. My mother was really knackered. Once a doctor had to come, because she was so exhausted. Yes, that is a matter of education for me, for sure. . ON THE OTHER HAND I like it, too, when everything is tidy. I have to admit, I do enjoy it." (P5)*

### The 'stain problem' – deconstruction exercise

From a social practice-based perspective, stain removal can be seen as problematizing the links between images, skills, and objects. Shove et al. (2012) stated that product innovation depends upon innovations in practice. The author explored the links of the elements (skills, objects, images) involved in doing the laundry by using a shirt prepared with tough ketchup and mustard stains as stimulus material. Each participant was asked to find a solution to the 'stain' problem. It was not the solution itself that was of interest, but rather the coping strategies, the persistence involved, and the role technology could play. At the end of the first interview, the participants were informed about the task and the shirt was given to them. In a follow up interview, the results were jointly evaluated and discussed. The participants used specific sensory metaphors to invoke conventions and values. The example of stains illustrates the relevance of the skill-image-object framework to identify innovations in practice well (Shove and Pantzar, 2005). Stains were considered to be 'unacceptable' (image) by all participants. Exemplified with a retired teacher (P13), who would not accept any stains on a shirt requiring her to find various strategies to remove them, involving her personal skills as well as objects like special detergents and the washing machine. She mystified the process by paying attention to "good laundry days" which are mentioned in the "moon calendar 2014." She reported about her persistent trials to get the stain out, without success:

*"Well, I have never been able to not remove a stain... Well, I just washed it normally. That is... at 60 degrees. Well, and then I thought I'll wait for 'good laundry days,' I trust in them. It might go out then. And then I washed it at 60 degrees. And powder, Sil with the main wash cycle. And this is the result. You still see something. It got a bit lighter, but..." (P13)*

A 67-year-old woman (P2), who lives alone in a house with a garden, reported about a different stain strategy by incorporating 'natural forces.' She started with a pre-treatment of the stain:

*"And then I put it into the washing machine. I washed it as usual with a washing detergent, with an intensive gel, this is what it is called, if it is extremely dirty. Yes and then out again and then I dried it, no, it wasn't gone and then I laid it outside into the sun onto a bush and I*

*always sprayed water onto it. The sun usually bleaches - no. I thought maybe this takes away the stain. But it didn't go out. Unfortunately not." (P2)*

Statements like *"I washed it as usual"* (P2), *"I just washed it normally"* (P13), *"I wait for good washing days"* (P13), and *"it has never happened to me"* (P13) underline how behaviour is carried out routinely and automatically. Therefore, this links to habits and routines that influence practices and usage patterns for both the 'rate of use' and the 'variety of use.' "Technology is not valuable, meaningful or consequential by itself..." (Feldmann & Orlikowski, 2011, p. 11), it only becomes so when people actually engage with it in practice. This can occur in two different manners: "prior research on technology use has introduced two related yet distinct constructs, namely experience and habits" (Venkatesh et al., 2012, p. 161). Experience is typically operationalized as the passage of time from the initial use (Venkatesh et al., 2012). Habit is defined as the extent to which people tend to perform automatically (Limayen et al., 2007; Venkatesh et al., 2012). "One distinction is that experience is necessary but not a sufficient condition for the formation of habit" (Venkatesh et al., 2012, p. 161).

### **Practices as a source for invention**

The statements and comments in the interviews confirm the statement of Shove et al. (2012) that laundering is a sequential process that includes the ordering of multiple laundry-related activities. Doing the laundry can be recognized as an integrated practice (Schatzki et al., 2001) that follows a certain pattern but it is not a mindless drudgery; all research participants reflect, adapt, improvise, and experiment in doing the laundry. A 70-year-old woman (P4) leads an active lifestyle; travelling frequently and socializing with friends are central in her life. However, she also takes her housewifely routines seriously. She, a retired housewife, mystified the process by using her *"wonder soap"* purchased from her holiday destination. Enthusiastically, she reported about her 'persistent' approach to solve the 'stain' problem.' Although it failed to perform as expected, her process showed how knowledge and innovation could be generated in practices.

*"I have tried to get it out, haven't I? ...But it didn't work out. ....So, I put it into the sink in the bathroom. Took an electric kettle, with really hot water, and poured it onto the shirt, right? Then I took a wonderful*

*soap from Turkey, that is such a wonder soap, a little piece, I always take that with me. I rubbed the shirt with it. The red stuff was gone, right. Then I took it and had a lot of shirts and I put it at 60 degrees into the washing machine, you see? Hoping that it comes out – it hasn't..." (P4)*

Summing up, the findings are affirmative that prior experience affects both 'variety of use' and 'rate of use.' Finally, the author follows Venkatesh et al. (2012) and complements that concept with habit. The determinant is changed to prior experience and habit.

#### **4.1.4.4 Socio-technical arrangements**

The determinant socio-technical arrangement emerged through the analytical process. In this study, by deconstructing the laundry process and by moving together with the participant through the home, provided insights beyond technical appliance improvements. The home visits showed the importance of understanding the processes "in getting the job done" (Bettencourt & Ulwick, 2008, p. 109) and to experience the challenges of the living environment to discover opportunities for innovation rather than observing how the machine is put on. As Kumar and Whitney put it (2007, p. 49), "looking at activities that surround the product, rather than getting reactions to the product ... leads to breakthrough ideas that are grounded in how people are living."

#### **Validation and expansion**

In various influential studies, the housing type (McCreadie & Tinker, 2005) or the physical environment (Rogers & Fisk, 2010; Wahl et al., 2012) have been suggested as influencing older people's technology adoption. However, this view seems to be insufficient and needs to be extended. The home interviews and observations revealed that the 'cohesion of objects' in the home plays a major role in affecting practices and use patterns. To understand the arrangement of laundry artefacts, their "throwntogetherness" (Massey, 2005, p. 130) over years or decades is important because they provide a relatively stable structure in which the practice must be done as the appliances cannot be placed everywhere in the house due to technical installation requirements.

### **Structures provide security and prevent change**

The tour through the home confirmed that doing the laundry requires a configuration and an arrangement of products that enables reproducing this practice in an efficient manner. Through the shared laundry route (Pink, 2009, 2012), the author asked about changing the location of the appliances. All participants fiercely rejected this idea due to ‘installation issues.’ Most participants also strictly rejected to use a dryer and preferred drying clothes outside in the garden to save energy. With regard both cases, Bourdieu’s (1990) habitus and Giddens’ (1984) structuration comes to mind, which seems to leave little room for change, “structured structures predisposed to function as structuring structures” (Bourdieu, 1990, p. 53). Giddens’ structuration theory revolves around the conclusion that human activities and the social structures that shape it are recursively related. Thus, it confirms that usage patterns are less ‘deliberate choices,’ but embedded in rigid structures.

### **Home and agency**

Most of the participants live in urban areas and in spacious, two storey houses. However, for most participants their living places are no longer appropriate, as mentioned by an older man (husband of P10): *“But that is much too big for us. What do we want with so much living space?”* As the location of the washing machine was the cellar, stairs were the most problematic and challenging areas in the home related to mobility. The steep staircase, *“seventeen steps”* as one older woman (P12) emphasized, could become an usage and risk barrier (Ram & Sheth, 1989) in the future as her husband realized: *“Well, it depends a bit on the age, as I have said before with going into the cellar. This could be a problem at a certain age.”* (P12) This implies that doing the laundry cannot be fully understood in isolation from what Ingold (2008) called the “meshwork” of place. In this sense, undressing, collecting the laundry, sorting, operating the washing machine, drying the laundry, ironing, and dressing are carried out amid the arrangements of objects in the home of the elderly (Schatzki et al., 2001). These activities are done in different places in the home and are linked through movement, which involves certain risks.

### “Down there”

All participants located the machines “*down there*,” in the cellar; no machines were placed in the living room like the bath. It must be underlined that the video enactments and process and product demonstrations are not observations of naturalistic behaviour (Pink, 2012). Nevertheless, the ‘embodiment’ (Lai et al., 2008) was clearly visible. Moving through the home with a basket full of laundry involved moving down narrow staircases, bending down to load the laundry in the appliance, and demonstrating the operation, which frequently occurred in a dimly lit cellar. In this process, the participants did not use only words, but also their whole body movement to describe the process of doing the laundry. In many cases, the drying process was done outside the house, such as in the garden or in a separate room. The ironing job was primarily performed in the living room. Observing those activities and locations created images and told a story about the future when health declines would occur. Most participants have been living in their houses for more than fifty years. Traditionally, laundry has been a task completed in a clammy and damp cellar. One 69-year-old woman reminisced:

*“In earlier days doing the laundry was like that: On Saturday it was soaked in big tubs and on Mondays it was washed. It was washday, there was nothing to eat, only the left-overs from Sunday and really with this old M. washing machine.” (P8)*

Even today, the high tech appliances are still banned from the living environment as mentioned by a 75-year-old woman (P13): “*As long as we are here in this house, for over fifty years, the machine is located down there*,” which underlines that “places and paths are anchored at objects” (Schatzki et al., 2009, p. 36). In all cases, effort is required to move down to the cellar: “*I go to the cellar a lot of times. One has a lot of things down there*” (P12). As an older woman does the laundry, she proceeds through places that determine her activities: carrying the basket full of laundry, for instance, from the cellar to the living room to watch TV while ironing. One participant (wife of P9) mentioned the following about doing the laundry:

*“... I have a room where I can do my laundry, which is very comfortable. You don’t have to go to a dark and cold cellar, but you have a nice environment... so that it is no imposition.”*

That statement exemplifies that “objects script practices” (Shove et al., 2012, p. 121), which requires to pay attention to the physical burden and the embodiment (Lai et al., 2008). This can be exemplified by the comment of a 70-year-old woman (P4) regarding the carrying of clothes in the cellar and sorting of clothes: *“I carried a basket full with dirty laundry into the cellar, sorted it depending on the washing programmes and ran the machines (I have got 2)!“* (P4) The already in place living arrangements (Gomez, 2015) lead to path dependency (Shove, 2009), which influences technology use. As a consequence of moving down steep staircases, some participants reported about their fear of falling during this kind of process activity. A 69-year-old athletic man (P1) wondered how to avoid carrying down the laundry basket to the cellar because even to him *“each step is a danger.”*

*“No, the only thing as I’ve said before, but that is not possible in the house, is as I said, a laundry-slide, into the cellar. Nevertheless, I talked to someone who told me that it is possible outside. You don’t need to go down the stairs with the basket – no, because that has always been dangerous. Not for me, because I grasp the basket with one hand, but for G. (John’s partner) walking down the stairs with no hands that is not easy at all. And suddenly something happens.” (P1)*

*“I just went down the outer stairs with a hose reel and all the drums, with rubber boots, and got caught; by chance I could just get a hold. Each step is a danger.” (P1)*



**Figure 29: Steep staircase to the laundry room (P1)**



**Figure 30: Laundry slide to the cellar (P9)**

In two cases (P7, P9) the need to carry the laundry basket from the bath to the cellar was eliminated by throwing the dirty laundry into a laundry bin in the bathroom, which directs the laundry through a pipeline in the house to the wash cellar. The modification reveals “changing practices means changing the social order” (Hargreaves, 2011, p. 93); therefore, the process of carrying down the basket through steep staircases was eliminated. However, it seems that no solution has yet been found to return the finished laundry. In a different case, a participant (P7) presented a ‘work-around’ by using the stair lift to carry the laundry to the upper floors.

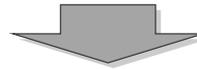
### **Emotional and structural bonds**

It seemed intuitive that participants consider and execute home design modifications early, as the process of home remodelling requires time to plan (Trentmann, 2009). Modifications may enhance the wish to age-in-place in the ‘Fourth Age.’ However, talking about the possible architectural modifications relating to mobility most participants did not consider any modifications until a health crisis forces them to do so (P7). It confirms the view of scholars (Kruse et al., 2012; Mollenkopf et al., 2010) that older people do not anticipate or suppress the imagination that someday they require support. Despite a few exceptions current practices are sustained even protected by participants.

Scholars aiming at behaviour change need to be aware that “...their capability to proactively alter or create environments is likely to be neglected” (Peine & Neven, 2011, p. 135). In a nutshell, acknowledging the path dependency” (Shove, 2009) in the ‘doing’ requires contextualizing a technology in the daily structures where practices are embedded. These socio-technical arrangements can have physical nature, but also emotional. Here the “recursivity is crucial” (Feldmann & Orlikowski, 2011, p. 14) as recurrent actions shape structures and vice versa. To sum up, doing the laundry cannot be understood as being performed in isolation from the wider environments of which it is a part. Hence, in order to facilitate the domestic job of doing the laundry, a wider research scope is required that is more holistic than cognitive models of user acceptance models.

Table 24: Modified determinants (based on Shih & Venkatesh, 2004)

		Determinants	Description and Explanation
Literature Review	Household Social Context	<b>Household communication</b>	<ul style="list-style-type: none"> <li>Household communication intensity</li> <li>User can discuss questions with others</li> <li>Word-of mouth communication, use of social networks, etc.</li> </ul>
		<b>Competition for limited resources</b>	<ul style="list-style-type: none"> <li>Access to household technology</li> <li>Competition for household technology among family members</li> </ul>
		<b>Prior experience with the technology in the family</b>	<ul style="list-style-type: none"> <li>How long the household appliance has been used</li> <li>Age of washing machine, dryer</li> <li>Familiarity with and dependence on technology</li> </ul>



		Determinants	Description and Explanation
Modified Research Framework	Household Social Context	<b>Household communication</b>	<ul style="list-style-type: none"> <li>Technology use (mainly variety of use) is affected by household communication 'intensity' and 'quality' which depends on possibility of peer-to-peer communication (intra-generational) and influence of children (inter-generational)</li> </ul>
		<b>Prior experience with technology and habits</b>	<ul style="list-style-type: none"> <li>Repetitious patterns of activities influence variety of use (e.g., hand wash of woollens)</li> <li>How long the household appliance has been used</li> <li>Age of washing machine, dryer</li> <li>Familiarity with and dependence on technology</li> </ul>
		<b>Socio-technical arrangements</b>	<ul style="list-style-type: none"> <li>Technology use (mainly rate of use) is embedded in 'pathways' of doing the laundry and rigid 'laundry routes'                             <ul style="list-style-type: none"> <li>'Cohesion' of appliances (washer and dryer) results in strong resistance to relocate the current structure</li> </ul> </li> <li>Location of washing machine usually in the cellar (through staircases), drying sometimes outside</li> </ul>

### **4.1.5 Technological dimension**

The technological dimension consists initially of two determinants (technological sophistication and use of complementary technology) and refers to the overall technological environment of the elderly user (Shih & Venkatesh, 2004).

As in the previous section, the following table displays a summary of the number of participants that confirmed (x) or did not confirm (o) the influence of a specific determinant. From the table, it is immediately visible that most participants did not utilize the versatility and capabilities of the washing machine. The use of a dryer as complementary technology was a controversial issue because other means were preferred. Only two participants regularly used a dryer, in most cases the use was disputed and in some cases rejected fiercely for its waste of energy.

Table 25: Participant feedback (based on Shih & Venkatesh, 2004)

	Determinant	Description	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Technological Dimension	Technological sophistication	Includes the used characteristics of an appliance User utilizes versatility and capabilities of the appliance High level of comfort with newest technology	+	o	o	o	+	o	o	o	+	o	o	o	o
	Use of complementary technologies	Complementary products (e.g., dryer) frequently used	o	+	o	o	o	o	o	o	+	o	o	o	o

### 4.1.5.1 Technological sophistication

The home interviews sought for a validation and a possible enrichment of the determinant ‘technological sophistication.’ That determinant groups material elements, which are related to household practices, ‘technological sophistication’ includes the inherent characteristics of the technology (Shih & Venkatesh, 2004), which is operationalized with the ‘versatility’ and ‘capabilities’ of the product.

#### Validation and expansion

During the joint ‘laundry route,’ specific features and a number of features were discussed in an open manner, in front of the appliance. The author wanted to know which product characteristics were important and which features were used regularly and why. Some participants (P8, husband of P6, P13) declared their strong hesitation toward technology in general:

*“Only, if there is too much technology inside, I can’t cope with that.  
So, I can switch it on and off, that is what I can do ....”  
(husband of P6)*

Participants expressed important characteristics of washing machines.

*“Well, the more technology the more susceptible it is. There used to be two buttons, I had one button for I don’t know what and the other one for the temperature. There wasn’t much technology.” (P12)*

Some characteristics and features of the washing machine were discussed significantly more frequently than others. Many participants (P2, P3, P6, P7, P8, P9, P10, P11, P12, P13) did not wish to use devices with a lot of features, which is also a reason why a washer dryer combination is for one participant not the right machine (wife of P9):

*“But I prefer buying an additional device instead of having a multifunctional device with too many functions in one, because I have the experience that if one piece is broken, you are helpless. So I avoid that. I would never buy a washing machine with an integrated dryer; this is like...firstly, I can do two things at a time, I can wash the next laundry and the other one is drying at the same time. It is much more time efficient and these machines, they haven’t proved themselves.” (wife of P9)*

This is puzzling, as innovation adoption research has stressed that ‘relative advantage’ is a key driver of user adoption (Rogers, 2003). A 71-year-old woman (P11) outlined the most important characteristics of her new dishwasher and regards her husband as not competent to *“talk about things like that.”* Basically she needs two programmes: a normal and an economical washing programme, indicating a low ‘variety of use.’ *“We don’t need so many programmes. There is a normal one and an economical washing programme. Everything gets better. It starts with the filling of the salt and things like that, right? (laughs)”* (P11)

### **Strong concerns if tied to manufacturer technology**

The primary data go hand in hand with the literature regarding ‘loss of control.’ Strong concerns were mentioned by some participants (P7, P8, P9) regarding ‘usage constraints’ and ‘paternalism’ in technology, when the technology was too sophisticated. *“I would like to press some buttons according to my rhythm and I don’t want the machine to do that for me”.* (Wife of IP7) Talking with a retired engineer (P 9) about future technological concepts, he requires the flexibility to be creative in doing amendments: *“I think that it is too much technology, because it ... doesn’t leave me enough creativity.”* (P9) This draws the attention to the influence of managers and designers because these “scripts” (Akrich, 1992) define how a product should be used and influence what an elderly person is doing and how much flexibility one has in using the product. Designers and product managers attempt to anticipate how people will use a product and put their ideas into a product in form of scripts (Akrich, 1992; Neven, 2014; Shove et al., 2012; Peine & Neven, 2011; Woolgar, 1991). As the technical objects define the framework of user action (Akrich, 1992), it is crucial for any autonomy enhancing innovation (Herstatt et al., 2011) that an accurate understanding of user representation is achieved which is the starting point to define the specific scope and degree of user flexibility.

### **Simplicity does not mean fewer features**

It became apparent that older adults prefer to stay with familiar technology and do not require an extension of programmes, thus ‘variety of use.’ From the vantage point of managerial and design practice that means that it is not recommendable to take further tasks away from the user, generally speaking.

Some participants expressed their unwillingness to sacrifice existing features, which seemed contradictory and counter-intuitive. Although not all participants confirmed the need for a wide range of programmes, some did not want to sacrifice features even though those features were used infrequently. When they were asked which features could be eliminated, the participants made statements such as, “*No, I actually need everything*” (P10), which confirms Norman (2011), who argued, “people really want features” because “We do not wish to give up the power and flexibility of our technology” (p. 51). This goes hand in hand with a social practice based perspective. As it appears, “if tasks are too simple boredom ensues, if they are too difficult then anxiety is aroused. Best to have activities which fall between, where challenge and competence are in balance (Warde 2005, p. 143). Programmes for delicate garments, temperature options, and spin speed were mentioned as further examples of specific features with high relevance. Spin speed referred to the ability of the washing machine to reduce the amount of water from the clothes after the washing cycle. This was a pervasive view by all participants’ for two main reasons. First, it was particularly important as most participants did not have or refused to use a dryer. So a high spin speed would reduce the time of drying. Second, for people that owned a dryer, it was important “to have a good spin” because it reduces the time of drying and the consequent operating and energy costs of drying.

### **Covert resistance**

As previously discussed, it is only through repeated performances that practices are sustained (Shove & Pantzar, 2005; Warde, 2005). The in-home observations allowed the author to note covert resistance to new technology while observing the appliances in the kitchen. Some participants dislike the additional work involved in learning all of the new options and functionalities. Participant twelve referred to her new premium food preparation appliance: “... *I hardly need it. Well I don’t need it at all.*” (P12) Here the question of technology acceptance becomes obvious. The main argument many participants noted about technology was the lack of practical usefulness. A retired housewife in her midst 70’s (P3), reported about her brand new coffee maker with single portion preparation and her new microwave, both presents from her children. From her perspective, both have the characteristic of being useless because

*“We don’t eat meals out of the microwave”* (P3) and prefers her traditional filter coffee, which she describes as *“a real coffee”*:

*“It took up all the space in the corner. We don’t eat meals out of the microwave. What do I want with a microwave? ..... I put away the other machine, too. Nobody recognized that. ... And when they come, the girls, they make themselves such a coffee. No, I just let it stay here. We don’t want that. I want to have a real coffee.”* (P3)

She clearly wanted to stay with the old, more familiar coffee maker. As these were gifts from beloved ones, those appliances had a certain meaning and have not been removed from the kitchen. She also rejected a microwave that was given as a present by the sons and already returned it to one son. This appliance was regarded as too difficult to use, consequently it has never been used. It is very likely that this would not been expressed in focus groups or in the lab interview. However, to reduce this discussion to the technological dimension would miss the main point because the older lady (P13) was not completely opposed to acquiring new technical appliances. She made a distinction when it comes to her new electrical bike. She spoke enthusiastically about her experiences: *“I like to ride my bike; we have a small bike club. Now we have twelve electric bikes, wonderful... yes, young people do not have that, right? ...”* (P3) It seems that sharing a practice and doing things together with friends lend meaning to her life; thus, those actions help to integrate new technologies. The electric bike, discussed as a new disruptive, autonomy enabling technology by various scholars (e.g., Kohlbacher & Hang, 2011) obviously supports her priorities in life. However, not in a rational sense of ‘going from A to B in a more comfortable manner’ as discussed in the literature (Kohlbacher & Hang, 2011) but as a means to be able to share practices with others.

### **“To wash small loads”**

From a social practice-based perspective, the interviews revealed a surprisingly common usage barrier: The dominant wish for all of the participants is to save energy. However, “thinking green” was only relevant when it was associated with saving time and money. In general, the awareness of how to save energy was rare among the participants and was associated primarily with trying to avoid washing small loads. The author was particularly interested in the reasons

that adults reported *disliking* features and functions in their diaries, as these details could provide insight into usage patterns (i.e., the reasons for which a person might *not* use a the appliance or a feature). The ability to wash small loads was a dominant theme and a requirement mentioned in all of the interviews. *“That is a point where you can say: that’s nice. That you don’t have to fill the machine completely.”* (P10) The misconception of ‘not to being able’ to wash small loads was the main concern of all participants. Here the skills, objects, and image framework of Shove and Pantzar (2005) is helpful because the image of ‘small wash loads’ to ‘waste money’ was related to inconvenience because it required the participant to wait until enough laundry was collected, which clearly affects rate of use. A 75-year-old woman (P13) wondered how washing technology could assist her: *“I always think the same: Why do I have to wait so long until the machine is completely full? And that is for a small household...”* (P13) This finding was rather unexpected because the majority of washing machines have sensors that control water intake and adjust energy consumption according to load size. However, those features, which are ‘market standard’ for more than a decade, were not transparent or familiar to the participants:

*“My machine is at least ten years old. It changes to another programme when I only have small amounts to wash, then it doesn’t take so much time. It is that advanced already. But I think it... Are there some machines where you can wash only small amounts of laundry?”* (P13)

Habits and conventions influence usage patterns (in this case ‘variety of use’) and can be exemplified by a 71-year-old woman, who mentioned that without giving it much thought, she washes woollens by hand, mainly for economic reasons:

*“And if I have woollen items, like, I have a few red woollen items, I don’t wash them in the washing machine. I wash them by hand. I DON’T KNOW WHY, I could wash them in the machine, but... that is just, I have only just one, or two pieces and that is too much water and energy waste for me.”* (P6)

### 4.1.5.2 Complementary technologies

The determinant complementary technologies refers to the “technological density in the home” (Shih & Venkatesh, 2004, p. 62). As such, they can create synergetic effects; they influence the level of use of all the technologies in the product cluster (Shih & Venkatesh, 2004).

#### Validation and expansion

An older man (P1) mentioned a couple reasons that he chooses not to use a dryer, which he relates to drying clothing outside and includes aspects of convenience, energy consumption, and the sensory experience of ‘fresh laundry’: “... *it would be really a waste of energy, ... If I have a line and then the fresh air, that is the next thing, right? I would never have the idea to put it into the dryer!*” (P1) Ironing is a task that most describe as very annoying because it costs some physical and time effort and it is boring. Some participants (P4) even ‘hate’ it: “*I don’t like ironing. I, well actually I hate ironing. It’s horrible. There are people who like ironing and that stuff. But I have never liked that. Ironing is bloody work for me.*” (P4) Doing the laundry seems to be a perfect example for the influence of complementary, but competing technologies as well. As an example, a 67-year-old woman explained how the features of the washing machine are linked to the drying process. For her, the spin speed of the washing machine matters because it influences the length of *the drying process*:

*“It is important for me that the spin speed is high. And well, that it has a short washing programme, for example... Because I dry a lot. No, if I... if the laundry is too wet, then the dryer takes longer, right? That is the reason, yes. ..”* (P2)

#### Sensual experience

The concept of ‘smell’ and ‘fresh laundry’ was a major theme throughout all interviews (approx. 30 coded segments overall interview transcripts), which was mainly related to drying outside: “*Cashmere can be hung up easily outside on the balcony over night, when the humidity gets to it, that is what they all like. (Everybody agrees). No – it helps. Then they are fresh again.*” (P2) To sum up, the primary data suggests an extension of the determinant complementary technologies with competing activities. The findings suggest that

'complementary and competing activities' act as substitutes or can create synergetic effects to an existing technology, thus affecting use patterns.

### **4.1.5.3 Price value**

One single theme in the technology dimension was discovered as highly important for all participants; that theme is the 'cost,' 'price,' or 'money spent' for an innovation or technology as indicated by almost 300 coding segments throughout all transcripts analysed. It confirms that, "the cost and pricing structure may have a significant impact on consumers' technology use" (Venkatesh et al., 2012, p. 161).

### **Validation and expansion**

There are two common strategies to overcome the value barrier. First, to provide significant performance value over existing alternatives and second, to reduce the product cost and lower the price (Ram & Sheth, 1989). The literature reveals the perspective that some elderly customers, who are not financially well off e.g., due to a lack of savings and small pensions, are not looking only for easy-to-use but also for cheaper products and services (Herstatt et al., 2011; Kohlbacher & Hang, 2011). It can be expected that some older people are excluded from technology not only by physical or cognitive disability, but also because they cannot afford it (Blythe et al., 2005). To overcome this value barrier (Ram & Sheth, 1989) underlines a disruptive innovation strategy that puts emphasis on affordability and not only on functional matters. "Price value" (Venkatesh et al., 2012, p. 161) is assumed to influence usage patterns once those products have been implemented in the home because they typically have a reduced scope of features, which influences variety of use. Schmidt and Druehl (2008) stated: "The low end of a product's market is defined to consist of those customers with the lowest willingness to pay for the product (they have the lowest demand for the product's key performance attributes)" (p. 350). During the interviews, the author presented a sales offering for a washing machine promoted in a retailer leaflet at a price of 249,- € as a stimulus material. From the initial reaction of the participants, it was clearly perceived as a very aggressive price offer. This theme resulted in lively debates about the 'right' price linked to cognitive trade-offs, quality concerns, ethical standards, and moral values.

### **“Not for me”**

In a study by Neven (2010) “obviously, not for me” was a common response when elderly users were asked about social robots. “Obviously, not for me” was a very common remark regarding low priced machines and the associated quality (P5, P10); a 72-year-old woman, who expressed a high brand loyalty, related this offer to students as a more appropriate target group. *“But if I had someone I knew about, that he was in trouble, financially, I don’t know, maybe a student or someone who didn’t have a lot of money, I would tell him: ‘Well, it is worth the risk’” (P10)* A similar rejection was expressed by a 67-year-old woman, who told her son the story of her negative experiences and her lessons learned (*“the one who buys cheapest, buys twice”*) with low priced products. She discussed her acceptable price range with her son:

*She (P2): “Yes, if you get such a leaflet, it is really astonishing how cheap they are. But I think I wouldn’t buy such a cheap one. I think it can’t be of a high quality, can it? I mean... So, you know, what I say, I say that also to T. sometimes ‘The one who buys cheapest, buys twice.’ He always laughs at me, doesn’t he?”*

*Son: “Yes, that is right, yes.”*

*She (P2) “You have often told me that I would have been better of if I hadn’t bought a thing. I say ‘What did I tell you?’ I would buy one for the medium price. .. not the most expensive one, but for a medium price, with security and a bit more. “*

Following the literature, finding the ideal customers for a low-end disruption seems to be relatively straightforward because “they are current users of a mainstream product who seem disinterested in offers to sell them improved-performance products” (Christensen & Raynor, 2003, p. 101). However, it appeared not to be that straightforward for elderly customers; their consistent reactions reflected that additional functionalities were rejected because those features were not ‘required anymore’ and “obviously, not for me” (Neven, 2010, p. 335), on the other hand a low price was mistrusted and associated with low quality and something to be careful of. In most cases, the low price was immediately related to the ‘perceived quality’ (image barrier) as some participants mentioned (P10, P13):

*"If I speak for ourselves, I can say: 'Oh, be careful!' I won't spend three hundred Euros on a device to which I'll say in two years: 'Let us throw it away!' That is an expensive device then." (P10)*

*"But funnily, if something is really expensive, I always think that it (laughs shortly) has to be good, hasn't it? (reads) ...I like to pay a bit more for household devices because the quality is better and they last longer." (P13)*

### **"Price value" considered from the proximity of death**

With regard to the quality and longevity of an appliance, the participants commonly remarked that a household appliance no longer needed to last for a long time because they would not be able to use it for its full life cycle. Thus, that statement can be extended to "obviously, not for me anymore." The participants related their remaining life times with the longevity and purchase price of the appliance, which the author had not expected. Their 'investment' is considered not from the starting point of life, but from the end of life. That sentiment represents a fundamental difference when compared to other consumer segments, like students. As an example, one woman mentioned (wife of P7) that the purchasing criteria for washing machines change in later life and that longevity is not important anymore. *"They don't get broken. We already had them...And at our age we don't buy them anymore, because they get so old and they survive us then."* (wife of P7) This quote confirms other literature sources (Suopajärvi, 2014) that the proximity of death means also that the elderly participants did not want to purchase expensive household appliances that they might not be able to use for a long time. The author follows the idea of Venkatesh et al. (2012), who defined "price value" as consumer's cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them. "The price value is positive when the benefits of using a technology are perceived to be greater than the monetary cost and such price value has a positive impact on intention" (Venkatesh et al., 2012, p. 161). Against this background, it would be fatal for a company to offer an extremely low price, as this would immediately be associated with very low quality. To follow the strategy of offering 'good enough quality' (Christensen, 1997, 2013; Christensen & Raynor, 2003) at a medium price range is seen as the recommended approach. Furthermore, the operating costs are taken into account by elderly when it comes to specific features. Energy saving functions

are highly valued. Thus, the author adds price value as a determinant influencing the use of technology. In summary, the technological dimension has many facets when it comes to the role and importance that it has on usage patterns. From a Latourian perspective, the discussion has clearly shown how a mundane, every day object like a washing machine has an agency of its own (Latour, 1996; Miller, 2010). It appears, that much too often “things do things to us, and not things we want them to do” (Miller, 2010, p. 94).

**Table 26: Modified determinants (based on Shih & Venkatesh, 2004)**

Determinants		Description and Explanation
Literature Review	<b>Technological sophistication</b>	<ul style="list-style-type: none"> <li>Includes the inherent characteristics of a technology, its versatility and capabilities</li> <li>Level of comfort of users with newest household appliances, use of smart technologies (PC-tablets, etc)</li> </ul>
	<b>Complementary technologies</b>	<ul style="list-style-type: none"> <li>Substitutes used for doing the laundry, washing and drying. Other resources used, e.g., dry cleaner, to dry outside, hand wash</li> <li>Relative advantage of substitutes (e.g., saving energy costs)</li> </ul>



Determinants		Description and Explanation
Modified Research Framework	<b>Technological sophistication</b>	<ul style="list-style-type: none"> <li>Includes the inherent characteristics of a technology, its versatility and capabilities affects mainly variety of use. Level of comfort of users with newest household appliances.                             <ul style="list-style-type: none"> <li>Overburdened by smart technologies with functional complexity (variety of use). Familiar user interface and limited range of features preferred.</li> <li>Trade-off 'small wash loads' versus 'energy saving' (rate of use)</li> </ul> </li> <li>Strong concern regarding paternalism of technology (variety of use)</li> </ul>
	<b>Complementary and competing activities</b>	<ul style="list-style-type: none"> <li>Relative advantage of substitutes (e.g., not using the appliances due to energy costs) affecting rate of use.</li> <li>Hand wash still frequently preferred for special items (e.g., woollens)</li> <li>Dryer usually abandoned for its energy use</li> </ul>
	<b>Price value (Venkatesh et al., 2012)</b>	<ul style="list-style-type: none"> <li>Perceived affordability of a product includes price and operating costs, particularly energy costs affecting rate of use.</li> <li>Medium price level preferred with strong link to perceived quality of appliance. Investment calculated from the proximity of death (affects variety of use due to lower specified products)</li> </ul>

### **4.1.6 Personal dimension**

As in the previous section, the following table displays a summary of the number of participants that confirmed (x) or did not confirm (o) the influence of a specific determinant. Initially, the personal dimension consisted of two sub-determinants (use innovativeness, frustration with technology) from the original framework by Shih and Venkatesh (2004) and was extended by technical self-efficacy and life course as derived from the literature review. At a first glance, the table indicates that changes in the life course represent an important determinant that affects the usage pattern of an appliance. Typically participants with a low technical self-efficacy express also a high frustration with technology. These persons seem to have also a rather low inclination for the acquisition of future technologies.

Table 27: Participant feedback (based on Shih & Venkatesh, 2004)

Personal dimension	Determinant	Description	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	
	Use innovativeness	Being experimental Having an inclination to try different things Open to new technologies	+	+	0	+	+	0	0	0	0	+	0	+	+	0
	Frustration with technology	Regards technology as too complex Expresses high level of frustration because technology fails to perform as expected	0	0	+	0	0	+	+	+	+	0	+	+	+	+
	Life course	Events in life change use patterns Biography influences use patterns	+	+	+	+	+	0	+	+	+	0	+	+	0	+
	Technical self efficacy	One's belief to be able to cope with technology	+	+	0	+	+	0	0	0	0	+	0	0	0	0

### 4.1.6.1 Use innovativeness

The determinant use innovativeness relates to consumers who are experimental and have an inclination to try different things (Shih & Venkatesh 2004). It appears that innovativeness has a direct link to variety of use. Use innovativeness was operationalized with use of new technological devices like smartphones, tablets, or personal computers.

#### Validation and expansion

It was rather unexpected that the word 'fear' was mentioned in various interviews. Occasionally, fear was related to an unsecure future, but it was primarily related to new technology. *"Physically and mentally, the most fear is that there is someone with dementia or something like that, that the partner gets ill and that nothing works then anymore."* (P1). The statement of Norman (2013) seems to be particularly true for household products, "Technology changes rapidly but people and culture change slowly...Older products linger long after they should have become obsolete..." (p. 268). As it appears, with fatal consequences for some potential customers: *"I am even afraid of a new washing machine."* (P8) The washing machines used were mainly 10 years or older; one participant (P5) reported that she still occasionally uses her 28 year-old dryer. The desire to stick with familiar technology also emerged during other interviews (P11): *"for washing machines and then we've just bought the same one again, haven't we?"* However, the interviews did not confirm a negative or passive attitude toward new technologies that was common to all participants. Some appreciated modern devices like mobile phones to communicate. Only a few participants had personal computers and Internet access, which were used for a whole range of purposes, such as mailing, buying products like shoes, or Skyping with relatives. As an example, a 69-year-old man (P1), who was very interested in technical devices, compared his positive attitude toward the Internet with the attitude of a close friend who is just a couple of years older. He explained the cause as having come from a different 'generation':

*"... you see I am not afraid of technology like the most, there are some who close their minds to technology. I have a mate, born in 1937 in Nuremberg, self-employed businessman... but when it*

*comes to internet he is..., that is just the generation, there are three buttons too many on it and everything is over.” (P1)*

### **Breaking links causes fear**

Fear relates to breaking links or disrupting the social order. Practices change when new elements are introduced or when elements are combined in new ways. With regard to the functionality and credibility of a rather new feature in the segment of washing machines, an automatic dispensing system for detergents, participant thirteen raised doubts: *“I am a technical one-off. I can’t imagine such a thing.” (P13)* To focus on innovations targeted at the elderly, “making new links is almost certain to involve breaking previously important ties” (Shove et al., 2012, p. 58). This is very true for a 70-year-old woman (P4), whose ambition is to be even with or ahead of others when it comes to technology. In the last year, a single piece of technology has changed her life: a Samsung tablet. She has used a mobile phone for some years, but found the tablet more appealing due to the possibility to access the Internet, create photos, and to write E-mails.

To sum up, a general lack of technical self-efficacy was prevalent in most of the interviews. Some of the elderly openly admitted that they thought they were too old for new technologies (*“we are the ‘old’ generation” P11*) affecting rate and variety of use.

### **4.1.6.2 Frustration with technology**

As discovered in the previous section, frustration arises from technological specification, which confirms the statement of Norman (2011) that there are two keys in coping with complexities: “First the design of the thing itself that determines its understandability ... Second is our own set of abilities and skills” (p. 4). The latter relates to the personal dimension of the user. “As there are diverse social practices and as every agent carries out a multitude of different social practices, the individual is a unique crossing point of practices, of bodily-mental routines” (Reckwitz, 2002, p. 256), which indicates that it is still the user who is responsible for the end result. However, the primary findings presented in the following unravel a different ‘culprit’ (Norman, 2013).

### **Validation and expansion**

Surprisingly, the home visits revealed that in almost every household some electrical appliances were not used or used only in certain circumstances. That finding confirmed that “frustration arises because the technology fails to perform reliably or meet the user’s expectations” (Shih & Venkatesh, 2004, p. 62), which was described in an ironic tone by one participant (wife of P9) as we walked through the kitchen. She described the amount of work required to clean the steamer after use:

*“There is one kitchen device, for example, somebody talked me around, I have never wanted such a thing. That is my... (laughing) not very much loved steam cooker (laughing)...!.. Somehow I didn’t get used to that one. It is such a wet job to get the water out, for example.” (Wife of P9)*

An even stronger negative reaction occurs when user expectations are not met, particularly when that is combined with a poor and disrespectful customer relationship with industry representatives and retail management. This is the story told by a 75-year-old woman (P13) in which she described her experience with a young shop assistant in a mass market retail outlet:

*“I have to say, it was a catastrophe. That was more an obstacle than a help..... I tolerated that for 10 days... oh... that was a real obstacle machine in the kitchen. Well and the shop assistant told me: Yes, I don’t know, that is because of the company Philips – we have to send it to them. Yes, and I said: What do you say? Send it away? I don’t want it anymore... And I said: (and it is usually not my style) I want to talk to the manager... And she said: Wait a moment. She came back and said: We’ll take it back... No, I don’t want to experience that again.” (P13)*

It is fatal mistake for a retailer or company to handle a complaint in a disrespectful way, which leads to the other determinant of ‘external communication.’ As mentioned above, frustration with technology is not only a matter of low priced products, as mentioned by other participants (wife of P9): “... .. it can be designed beautifully and it is expensive, but doesn’t work, nonetheless. So, the price is not always the thing that matters in the end.” (wife of P9)

### **Mental models**

Most participants have used their washing machine or dryer for 10 years or longer; they have developed some efficiency and perceive themselves as dependent on the continued use of those machines. One elderly woman (P8) has built up a 'social relationship' with her washing machine, which she has used for 25 years. Her 'relationship' is so strong that she firmly resists replacing it, which points to the reciprocity of technology and human activities and relates to another phenomena: the duality of technology (Feldmann & Orlikowski, 2011). Participant three also stated that if her washing machine stopped working, she would prefer to buy exactly the same machine again because she feared that any other type would be too complicated for her: *"I'd buy the same one again, we could cope with this one very well."* (P3) The reactions of the participants confirm that designers and product managers should consider existing mental models (Higgins & Glasgow, 2012), and that "a silver product innovation which is based on an existing product platform has great potential to retain customer loyalty" (Herstatt et al., 2011, p. 10)

To sum up, the findings from the primary data are in line with literature (Norman, 2010; Chipchase & Steinhardt, 2013), which shows that frustration with technology arises not only from complexity due to excessive functionalities and features and a lack of capabilities or skills, but also from following conventions. In addition, features that are developed to reduce the burden of tasks tend to frustrate elderly users when they are restricted or constrained in operating the appliance. To alleviate that frustration, the flexibility and adaptability of functionalities is required.

#### **4.1.6.3 Technical self-efficacy**

The literature demonstrated that people with high self-efficacy, those who believe they can perform well, are more likely to view difficult tasks as challenges to be mastered rather than avoided (Bandura, 1997). In some studies by gerontechnologists, the concept of technical self-efficacy (TSE) was used to understand the technology acceptance of older adults.

### **Validation and expansion**

One 70-year-old woman (P4) described herself as a very sociable, communicative woman (*"I am a very outgoing woman"*) who loves her independence (*"we have separated wallets/accounts..."*). She has high self-efficacy when it comes to new technical developments and knows about social networks and uses her brand new tablet PC frequently. The determinant technical self-efficacy seems to influence use patterns and was related to fear when one elderly woman reported about her attitude to technological sophistication she stated (P8): *"I am too old for that, I think I can't cope with that technology. I HAVE TOO MANY FEARS OF DOING SOMETHING WRONG."* (P8)

One woman (P5) declared that it requires courage to cope with new technology. Embedded in this approach were moral arguments about what is important in life.

*"You have to have the courage to just do it. And then you can say, yes, I can imagine it like that. You have to move with the times. I always think, it is not just about household devices, it also refers to other areas. It is the same wherever technology and electronic overrun us and there is nothing we can do about it."* (P5)

### **"Learned helplessness"**

Norman (2013) referred to the construct of "learned helplessness" (p. 62) to explain why people blame themselves when they have a difficult time using objects in their environment: "...they stop trying..." (p. 62), which obviously affects 'rate of use.' Participant thirteen characterized her lack of understanding of technology in a humorous way: *"I have no technical flair. I am a technical one-off."* However to Norman (2013), "this false blame is especially ironic because the culprit here is usually the poor design..." (p. 63). The primary data confirmed the determinant 'technical self-efficacy.' However, it emerged that older adults are "falsely blaming themselves" (Norman, 2013, p. 63) when it comes to technology use, rather than "the culprit"- technology. This seems to be the case particularly for elderly men and household technology. To facilitate usage, particularly 'variety of use,' it seems to be necessary to follow the advice of Norman (2013) to eliminate error messages from user interfaces and instead, provide help and guidance.

### 4.1.6.4 Life course

The life course approach is based on the assertion that the life is a succession of events and activities in different stages and fields of life and is subject to many influences (Giele & Elder, 1998; Loe, 2015). It emphasizes common themes, changes and continuity in one's life and reflects how these biographical aspects influence and shape contemporary life, such as use of household appliances (Loe, 2015) and consumer behaviour (Mathur et al., 2005; Peine et al., 2015; Wolfe & Snyder, 2003). This approach could facilitate to identify potential concepts for disruptive innovations because "as people experience major life-changing events, they re-evaluate their priorities, product needs, brand and store preferences, and the criteria by which they select products" (Mathur et al., 2005, p. 126).

#### **The influence of the formative period**

The conversation with a retired teacher (P8) about how she acquired the skills of doing the laundry guided attention to the historic development of the practice, which can greatly contribute to both understanding it and finding opportunities to change it. "The best thing for me is ironing" this statement underlines that practices are reproduced through imitation, as one participant recalls the housework of her mother (P8):

*"Yes, yes, yes, that was in my childhood days. As a teenager, my mother had a real washing machine. But I know when I was a child those days were really hard for us children, we were not allowed to disturb and my mother said: 'The best thing for me is ironing and mending.' Maybe it is because of that that I really like ironing." (P8)*

In retrospect, the sequence of historical events has formed the idea of what is appropriate today. It also highlights how the complexities of images, skills, and elements used in making up a practice have changed over time (Shove et al., 2012). "It is because of my mother" mentioned one older woman (P8) and explained her own approach to housework in terms of both her upbringing and the sort of person she is.

*"It is because of my mother. This is so clear and obvious. My mom was exactly like I am today or HOW I HAVE BECOME. HOW I HAVE BEEN FROM THE VERY START. Since..." (P8)*

In order to gain an overview of the ways that a specific practice has changed and the associated links and configurations of elements over time, the narrative form emerged as the most suitable way to present that process. *“Three days went by,”* a woman expressed vividly her experience of doing the laundry as a child, roughly sixty years ago, where still fire had to be made by the mother to heat up the water (P8): *“You had to make a fire below it. And there were different tubs to rinse and then the laundry also came on the bleacher. Yes, and three days went by.”* (P8)

### **The ambivalence of retirement**

The author raised questions like “how has life changed in the last years?” and more specifically, “how has housework changed after retirement?” These questions opened up conversations about particular life events (such as becoming a grandparent, retirement, loss of spouse), but also about the proximity of death and the participants’ attitudes related to consumption. *“We leave it the way it was. Next year I will be 80, we don’t need that much anymore...”* (husband of P11) An older woman (P3) even wants to get rid of appliances, as these material objects are no longer important to her: *“I don’t have that much. Well, all the machines I had when the kids were still in the house, I gave them to my children.”* (P3) This seems to contradict Mathur et al. (2005), who emphasized that events in life make specific customer segments more receptive of marketing offerings than other segments. A more in-depth understanding revealed significant changes of usage patterns of the washing machine caused by having a small amount of clothes to be washed and dried as compared to the past when the children were in the house. As an example, a 67-year-old woman (P5) told the story how doing the laundry has changed after her daughters left home:

*“Because, I had to have a lot, there was a lot of laundry. Well, I don’t know if it is possible today to get washing machines where you can wash small amounts of laundry, so that I don’t have to fill the machine completely. I never get a full machine, it would be important for me, I would do that. I would prefer that in a dryer, too. .. as I said, energy efficiency is important for me and it is important to use the devices optimally.”* (P5)

For a retired teacher (P8), the transition into her retirement required a reorientation because she was used to the intensive work as a teacher. *“It took*

*a while until I found the routine I have now.*” She had a day-to-day routine when she was teaching; after her retirement she tried to give her life a certain structure as well. Domestic work used to be a stress factor while she was working. Nowadays, it is the contrary. For her, housework is nothing to be rushed, but something to be slowed down. *“I am more relaxed, because I don’t have the job stress anymore.”* The division of labour shows a certain pragmatic view: *“My husband doesn’t do anything in the household, as he is still working – even with 75 years.”* Domestic work is also a kind of workout for her: *“I don’t think that housework is exhausting, I see it also as a kind of fitness programme.”* However, ironing is something she really likes: *“I iron every piece of laundry, even underwear, towels, I really like to iron.”*

### **Resilience decreases**

A single person household in combination with extensive living space can affect ‘resilience’. In the research, the author discovered a mismatch of housing: older adults living alone or as couples in big houses. As ‘empty nesters,’ older persons living alone often find themselves in large family houses with more space than they require. Those homes are occasionally accompanied by grounds that require considerable maintenance and upkeep. As mentioned by one participant (P3): *“No, I can do it on my own. Upstairs everything is fully furnished. There is nobody upstairs anymore.”* (P3) When mobility declines, coping with domestic practices can be challenging. Big houses can be particularly demanding for an older person and can lead to poor resilience. One participant stated (P8):

*“It is much too much, if you can’t do it alone anymore. The house is 200m<sup>2</sup> and has a cellar. That is really crazy. It is crazy for two people. And we are not upstairs. Well, sure, my husband has his computer upstairs and our guestrooms, and there is a big room ... well, it is like this one and it is huge and nothing happens there. It is fully furnished and ... I have to clean it regularly, but...”* (P8)

One woman (P5) mentioned her limited physical capabilities: *“I can’t carry heavy things anymore.”* Despite these handicaps, she does the laundry on her own without any extra help, which makes her a victim of her own high standards. On the other hand, a retired secretary relates her good level of

fitness to domestic work *“as long as I am fit I don’t need a help for my household and the garden.”* (P10)

### **Clothing is not superficial**

A retired teacher in her mid 70’s, pointed out that she would never even leave the house to bring out the waste wearing the jumper she wears for doing the housework inside. That comment contributes to earlier statements that doing the laundry is charged with social significance where psychological aspects have to be taken into account; clothing emerged as an important issue. Chipchase and Steinhardt (2013) mentioned that just about every product can be seen as some metaphor for personal identity. That seems to be particularly true for washing machines and the relation to clothes.

### **“Old? Me?”**

During the interviews, the author wanted to know what the participants thought about the popular saying: *“fine feathers make fine birds.”* This approach might be compared to Nicolini’s (2013) call for *“zooming out”* and the need to consider which other practices *“affect, enable, constrain, and interfere”* (Nicolini, 2013, p. 230) with doing the laundry. Particularly, how the practices of dressing and clothing are linked with doing the laundry. The statements made by the participants regarding that saying clearly underlined that clothing is seen as an appropriate strategy to counter stigmatization. As mentioned in the previous section, *“to have fresh laundry”* and *“to be in good shape”* is something that matters to older persons because it influences self-perception. One older woman (P4) mentioned in an energetic voice: *“I am 70 and I am fit.”* The usual images that are associated with old age have an influence on her self-perception. She (P4) avoids ‘age stigmatized clothing’ (Twigg, 2014) and dresses in a modern way: *“not old grandma-stuff.”* This is in line with the findings of Day and Hitchings (2011) that *“avoiding old age is not just about covering up the ageing body in public. It can also involve avoiding certain styles or items of clothing that are stigmatized”* (p. 890). As mentioned by Miller (2010): *“Clothing was a kind of pseudo-language that could tell us about who we are”* (p. 12). One participant mentioned: *“For my husband, Jeans is a working outfit,”* which indicates that the process of ‘style diffusion’ depends on the cohort that wears them (Twigg, 2014). Despite being a heterogeneous

group with different personal circumstances and different biographical backgrounds, it is apparent that clothing and doing the laundry has a high significance for all participants. Doing the laundry is connected with cleanliness, which is linked to other positive social qualities. One woman (P2) stated in her usage diary: *“Doing the laundry is very important, because by doing the laundry the clothes get fresh again and are brought into shape again.”* (P2) Following a social practice-based inquiry when discussing the image and meaning of doing the laundry in-depth she mentioned:

*“Well, I’m nearly 70... If I put on clothes, which... which are worn by much older people. I think today it is a bit different but when I think about 50 years ago, how the old people ran around at my age then? Today it is quite different. Have a look at the old ladies, they smarten themselves, because they can afford it. But I think that what you wear says who you are. What you wear shouldn’t be old-fashioned. It should be modern, stylish, shouldn’t it? You just have another charisma, but if you run around like ... that. That’s my opinion.”* (P2)

It also confirms that older women are “moving younger” in their dress choices (Twigg, 2014) as a means to counter ageism. Doing the laundry and getting dressed are for the participants almost Foucauldian “techniques of self” (Foucault, 1988) because they help to reduce the marginalization traditionally associated with age (Twigg, 2014). The remark of the woman (P2) *“you just have another charisma”* can be interpreted as being concerned for oneself (Foucault, 1988) or “die Sorge um sich” (Grebe, 2013, p. 141) which relates to self-care and is expressed in avoiding old-fashioned clothing as a means of self-care.

To sum up, life course needs to be added as a major determinant because it directs attention to the relationship between individual lives and usage patterns. During the interviews, it was frequently demonstrated that usage patterns had been subject to changes during the life course. When it comes to use patterns, the ‘life course’ seems to have a major influence on the ‘rate of use’.

### **4.1.6.5 Selection, optimization, and compensation**

The determinant ‘selection, optimization, and compensation’ (SOC) emerged inductively during the analytical procedure and can be described as a “life management strategy,” where “selection, optimization and compensation can

be seen as key concepts for understanding successful ageing” (Freund, 2008, p. 94). This strategy of optimization through selection and compensation allows older people, despite reduced physical or cognitive capabilities, to cope with daily tasks.

### **Validation and expansion**

The participants frequently stated in the interviews that they were adapting housework practices and cope with them in a more relaxed, flexible and less stressful manner as mentioned by one of my participants:

*“I have less work than I used to have, much less. Maybe it has to do with the fact that I leave things undone. I don’t need it that perfect anymore. For example there wouldn’t have been so much paper on the table. I would have cleaned the table. I am no longer that perfect. It had to be tidy.” (P4)*

To “leave things undone” is a selection or choice that has an adaptive function as it guides and directs existing capabilities. Throughout the research, the research participants explained this kind of strategy of optimization through selection and compensation (see table below). It allows them, despite reduced physical or cognitive capabilities, to cope with daily tasks and to overcome various functional and psychological barriers (Ram & Sheth, 1989). It is regarded by scholars as a life management strategy (Freund & Baltes, 2002), a meta model of human development (Fozard & Wahl, 2012), or a “strategy to compensate for individual adversities” (Zimmermann & Grebe, 2014, p. 31). At its core, the model of selective optimization with compensation assumes an age-related decline of capabilities implying a decline of resources of the individual (Freund & Baltes, 2002). To Freund and Baltes (2002), out of a variety of opportunities, the older person makes a selection and choice, which is sometimes done unconsciously. To the authors, the selection leads to a focus on relevant targets and fields that have a high subjective importance. That also requires a re-evaluation of priorities and targets. Optimization includes learning new skills or the implementation of new means or instruments to achieve the targets selected (Freund & Baltes, 2002). If a current means is no longer sufficient to achieve the target, an alternative approach or means is taken that corresponds to compensation (Freund & Baltes, 2002).

**Table 28: Examples of SOC (Fozard & Wahl, 2012)**

Selection (goals/preferences)	Optimization (goal-relevant means)	Compensation (means for counteracting loss in blockage of goal- relevant means)
<ul style="list-style-type: none"> <li>•Electic selection</li> <li>•Specification of goals</li> <li>•Goals system (hierarchy)</li> <li>•Contextualization of goals</li> <li>•Goal commitment</li> <li>•Low-based selection</li> <li>•Focusing on most important goals</li> <li>•Reconstruction of goal hierarchy</li> <li>•Adaption of standards</li> <li>•Search for new goals</li> </ul>	<ul style="list-style-type: none"> <li>•Attentional focus</li> <li>•Seizing the right moment</li> <li>•Persistence</li> <li>•Acquiring new skills/resources</li> <li>•Practice of skills</li> <li>•Resource allocations (effort, time)</li> </ul>	<ul style="list-style-type: none"> <li>•Substitution of means</li> <li>•Use of external aids/help of others</li> <li>•Use of therapeutic intervention</li> <li>•Acquiring new skills/resources</li> <li>•Changes in resource allocation (effort, time)</li> <li>•Modeling successful others who compensate</li> <li>•Neglect of optimizing other means</li> </ul>

### Challenging themselves

The interviews showed that retirement has a rather ambivalent implication. On the one hand, it is seen as an escape from a stressful job (P1, P7, P8, P10) and having time and flexibility is viewed as a reward (P1, P8, P10). On the other hand, it can lead to a withdrawal and social isolation which some try to compensate for by getting involved in volunteer work (P7). In this regard, it is also important to consider what has been termed as the “ageing paradox” (Kruse et al., 2012; Mroczek & Kolarz, 1998), a phenomenon defined as the “the presence of subjective well-being in the face of objective difficulties (Mroczek & Kolarz, 1998, p. 1333). From this point of view, it seems that the older people are able to actively influence their subjective well-being by establishing goals which they seek to obtain, maintain or avoid. A 72-year-old woman mentioned that housework is no longer a burden because of the personal flexibility: *“Today it is not such a burden anymore, because I have, you have more time. You can organise yourself, can’t you?”* (P10) As the life-style has changed over the years it can be assumed that the attitude toward housework and the required artefacts has changed as well. As an example a 69-year-old retired teacher mentioned in her diary: *“Since I’ve been a pensioner, I have more time and composure.”* (P8) One 67-year-old woman (P5) reported proudly about her passion to iron fast. However, she utilized an adaptive strategy toward activities and herself (Fänge & Ivanoff, 2009) directed at her level of ‘perfection,’ which resulted in a different but still independent performance which can be termed as a ‘downshifting.’ *“Well, things have got*

*easier for me in the last years. I even used to iron the underwear, but I don't do that anymore, I just fold it.” (P5)*

### **Downshifting**

In the late stages of life, priorities are affected by an awareness of how the remaining time is decreasing (Kruse, 2013c; Loe, 2015). The primary data findings correlate to the existing literature; as one 75-year-old woman reported about her less is more attitude (P3):

*“I don't have that much. Well, all the machines I had when the kids were still in the house, I gave them to my children. Well, we had such a juicer and a mixer and things like that, I gave them to the children – I don't need that anymore. No, I really don't need that anymore.” (P3)*

This *“I really don't need that anymore”* consumer behaviour is often acknowledged as the voluntary simplicity or downshifting phenomenon (Shankar, Cherrier, & Canniford, 2006). However, the statement above is not to be misunderstood as resignation and loss of interest. For older people, it is necessary to set priorities that concentrate on the most important things in life. That also explains why the woman (P3) bought a new E-bike, which enables her to join bicycle trips on the weekend with the whole family. The author prefers to use the term downshifting in the German sense of ‘Entsagung’ as defined by Kruse et al. (2012, p. 64), which can be defined as “the highest form of self-determination.”

The statement above can be related to the model of selection, compensation, and optimization and helps to explain why housework is not seen as a problematic task by most participants, although physical limitations should predict negative statements. They stated that they have less work to do because they delegate certain activities to a domestic helper (selection), have more time and flexibility (optimization), and use or discontinue to use technical appliances (compensation) as compared to the past. Further examples of SOC as a common life management strategy (Freund & Baltes, 2002) and adaption technique for doing laundry have been found in almost all cases. (See examples below)

**Table 29: Examples of SOC based on participant feedback**

Selection	Optimization	Compensation
<ul style="list-style-type: none"> <li>• Focusing on certain housework tasks reduces effort: <i>"Maybe it has to do with the fact that I leave things undone. I don't need it that perfect anymore"</i> (P4)</li> <li>• Some participants use domestic helper: <i>"she is a pearl"</i> (P12) or share tasks <i>"my husband helps me wherever he can."</i> (P10)</li> </ul>	<ul style="list-style-type: none"> <li>• <i>"Since my pension I have more time."</i> (P10)</li> <li>• <i>"I take it more relaxed"</i> (P1)</li> </ul>	<ul style="list-style-type: none"> <li>• <i>"Due to all the technical devices a lot got easier."</i> (P6)</li> <li>• <i>"I don't need that anymore."</i> (P3)</li> </ul>

From a theoretical point of view, the findings are in line with the model of selection, optimization, and compensation (Baltes & Baltes, 1989; Freund, 2008; Fozard & Wahl, 2012). The model highlights that one way of adapting to declining capacity is to carefully select which activities are still necessary and desirable to perform, to optimize their performance, and to seek and use compensatory alternatives. This occasionally leads to a disadoption of technology as mentioned by a 78-year-old woman (*"I do not need that anymore"*, P3) or a continuation of use. From a Foucauldian "technology of self" perspective, an older person who chooses to have less appliances or features, empowerment involves a withdrawal from ownership and usage of technologies.

To summarize this section, it seems that disruptions in later life have a significant role not only on social life, but also affect usage patterns. These disruptions in social life cause a reorientation and sometimes a departure from habits and conventions. As confirmed by Mathur, Moschis, & Lee (2007), "life changing events present marketing opportunities as people buy products and services that ease transition and accommodate change" (p. 242). The primary data also confirmed that it is still important to allow for challenges in daily domestic activities (Fänge & Ivanoff, 2009).

**Table 30: Modified determinants (based on Shih & Venkatesh, 2004)**

		Determinants	Description and Explanation
Literature Review	Personal Dimension	Use innovativeness	<ul style="list-style-type: none"> <li>• Being experimental and having an inclination to try different things</li> <li>• Work-around to solve problems</li> </ul>
		Frustration with technology	<ul style="list-style-type: none"> <li>• Complex technologies often frustrate users</li> <li>• Frustration arises because technology fails to perform reliably or meet the user's expectations</li> </ul>
		Life Course	<ul style="list-style-type: none"> <li>• Events in life that changes housework and the use of technology e.g., retirement</li> <li>• Influence of 'technological biography'</li> </ul>
		Technical self-efficacy	<ul style="list-style-type: none"> <li>• One's perceived ability to cope with technology</li> <li>• One's perceived ability to cope with the practice</li> </ul>



		Determinants	Description and Explanation
Modified Research Framework	Personal Dimension	Use innovativeness	<ul style="list-style-type: none"> <li>• Being experimental and having an inclination to try different things affects mainly variety of use.</li> <li>• Influence of 'technological biography'</li> </ul>
		Frustration with technology	<ul style="list-style-type: none"> <li>• Complex technologies often frustrate users which affects both variety and rate of use                             <ul style="list-style-type: none"> <li>○ Frustration arises because technology fails to perform reliably or meet the user's expectations</li> </ul> </li> <li>• Breaking links of practices through new, unfamiliar technologies causes fear</li> <li>• Frustration arises from the technology dimension (excessive features and complexities) and personal dimensions (lacking skills and capabilities)</li> </ul>
		Life Course	<ul style="list-style-type: none"> <li>• Events in life affect housework and the rate of use of technology                             <ul style="list-style-type: none"> <li>○ Major change in usage pattern due to retirement or death of a partner</li> </ul> </li> <li>• Clothing has a strong influence to counter stereotypes</li> </ul>
		SOC	<ul style="list-style-type: none"> <li>• Technology use to compensate age-related declines (e.g., instead of drying outside in the garden) affects mainly rate of use</li> <li>• Technology as (one) means to overcome age-related declines (others: help of partner, domestic helper, take more time)</li> </ul>
		Technical self-efficacy	<ul style="list-style-type: none"> <li>• One's belief to be able to cope with technology affects variety and rate of use</li> <li>• "Learned helplessness" (Norman, 2013, p. 62) affects mainly rate of use</li> </ul>

### 4.1.7 External dimension

External factors influence use patterns in various ways, like a supportive social environment (Shih & Venkatesh, 2004). If an older person speaks to neighbours or friends about practices like cooking or doing the laundry, it usually involves the technologies involved in practices (Pink, 2005; Shove, 2003; Shove et al., 2012). Such communication might reinforce the belief system and behaviours. Shih and Venkatesh (2004) assumed that the use of technology outside the home also influences the use of technology at home. This might result in a lower rate of intensity because some time of using the product is taken up by use outside the home. However, this determinant seems to be very product-specific and of minor significance for household appliances. In addition, the authors argued that a higher exposure to media might stimulate involvement with technology, which also stimulates use intensity.

As in the previous section, the following table displays a summary of the number of participants that confirmed (x) or did not confirm (o) the influence of a specific determinant of the usage of a household appliance. The table clearly shows that external communication with friends, neighbours, and media is strongly affects usage patterns.

**Table 31: Participant feedback (based on Shih & Venkatesh, 2004)**

External Dimension	Determinant	Description	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	
	External Dimension	External communication	A supportive social environment Discussions with friends and neighbours	+	+	0	+	0	0	+	+	+	+	+	+	+
		External technology access	Use of technology outside the home influences the use at home Dry cleaner used	0	0	0	+	0	0	+	0	+	0	0	0	0
		Exposure to target media	Exposure to media stimulates involvement with technology (e.g., product test reports)	+	+	0	+	+	0	+	0	+	+	+	+	+

### 4.1.7.1 External communication

The determinant 'external communication' was found during the systematic literature review and is part of the use diffusion model of Shih and Venkatesh (2004), as explained in previous chapters.

#### Validation and expansion

This research also confirms that the social context of face-to-face communication within 'communities of practice' is central for usage patterns. Particularly for variety of use as shown in the following comments of participant four who discussed different types of detergents with her friends, including 'backing powder' to whiten clothes.

*"I have a huge circle of friends. We are 14 women and we meet regularly and we speak about such things, too. We talk to each other about a stain in a silk blouse, a fat stain: 'What can I do with it?' Or there is a woman with a linen tablecloth and she says: 'Have a look, I can't get the cocoa stains out.' Everybody knows something." (P4)*

#### Experts

The advice of a trusted expert, like a doctor, can even influence usage behaviour in the long run. Participant six vividly recalled communication with a doctor about the allergic reactions of her daughter. Although the conversation took place approximately 40 years ago, it was so significant to her that she still refuses to use softener for her laundry. One participant (P13) experienced a kind of social discrimination by the shop staff who did not take her complains and arguments about a water cooker seriously, which really annoyed her: *"I could have made mincemeat of this store – as if I was stupid."*

#### The gate to the world

For some participants (P1, P4, P7, P9, P13) the Internet or a smartphone provide "the gate to the world" (Rentsch et al., 2013, p. 11):

*"...I always said, years ago, 'I don't need a...well, computer or something like that.' Well, no, that is nothing for me', but I have recognized that it is really necessary in many cases, isn't it? And*

*then I thought: 'Either I have to say goodbye to this world, or I have to face it, haven't I? (Laughing).'*" (P13)

Hence, both the literature and primary data confirm that external communication influences usage patterns in various forms and can be confirmed as a determinant.

### 4.1.7.2 Brand relationship

It appears that "levels of trust in brands have been shown to correlate strongly with loyalty to brands and positive emotional associations with them" (Chipchase & Steinhardt, 2013, p. 159). Further, "much research has shown that younger consumers are more likely to experiment with brands, while older people are more likely to remain brand loyal" (Iyer & Reisenwitz, 2010, p. 32). However, when exploring the potentials of disruptive innovation, doubt was raised regarding whether this relationship to brands might be on the decline and if newcomers could attract older adults.

#### **"Girl, stop it"**

In addition to the findings from the literature (Joyce & Loe, 2010; Loe, 2015; Peine et al., 2014), this study offers a great deal of evidence that older adults are not willing to passively adopt products. Rather, they use products differently than intended or even refuse to use a product. A retired teacher (P8), also raised concerns regarding paternalism and losing control over technology (P8):

*She (P8): "... That I can cope with it. That there is not too much computer or other technology inside where I have to enter too much. I have heard of the new machines where you can't change a programme once you have chosen it. That would be terrible for me."*

*Interviewer: "Why is that terrible for you?"*

*She (P8) (laughing) "Yes, maybe you have made a mistake, right? Yes, and then the washing machine runs, you can say what you want (knocks on a metallic ground): 'Girl, stop it!' But, no, it goes on running, through to the end of the programme and if it finishes... yes."*

The comments "girl, stop it!" and "my girl" by an older woman (P8) further suggest that "people sometimes think of products as having a soul" (Aggarwal, 2004, p. 88). It underlines, that "once products and brands are associated with

human qualities people may interact with them in ways that parallel social relationships, and their interactions are guided by the norms that govern these relationships” (Aggarwal, 2004, p. 88). By taking the perspective of social relationship theory, a washing machine that is “*wasting energy*” (P13) or is “*doing what it likes*” (P8) violates these norms, as the following quote exemplifies:

*“WHERE I CAN STILL INTERVENE, if I do something wrong and choose the wrong programme. That I can stop that and I can say that now I am going to correct the mistake and that the machine doesn’t do what it likes.” (P8)*

Anthropologically, this confirms the centrality of “‘things’ and their use” (Reckwitz, 2002, p. 249). However, it does so with serious consequences because “‘things do things to us, and not the things we want them to do” (Miller, 2010, p. 94). Participant eleven declared that she does not like to be a passive user of technology because she wants to stay mentally active: “*You also have got to do a bit up there...*” (P11). When considering a purchase of a new household appliance, one participant mentioned (husband of P11): “*...well, usually you take brands that are popular and good.*” Hence, it seems some brands are “socialized members” (Aggarwal, 2004, p. 88) of the family. This was exemplified by a 70-year-old woman (P5), who prefers a brand that was used by her mother because it is a family tradition. “*But I would never buy a Vorwerk. BECAUSE MY MOM ALWAYS HAD MIELE DEVICES and that is nearly a tradition for us.*” (P5) This quote shows that “people sometimes form a very intimate bond with brands” (Aggarwal, 2004, p. 87) and an emotional relationship that is usually associated with very close friends or family members. Oliver (1999) defined brand loyalty “as a deeply held commitment to rebuy or repatronize a preferred product/service consistently in the future” (p. 34). Those long-term relationships are emotional bonds and represent important assets to an established company because loyal customers are likely to suggest the company’s products to their children or a friend. The interviews are in line with the findings in the literature (Evantschitzky & Woisetschläger, 2008; Wolfe & Snyder, 2003) indicating that brands are likely to profit from an ageing consumer market because “older people are more likely to value relationships...” (Wolfe & Snyder, 2003, p. 112) and prefer “stable relationships.” It appears that “since strong brands are characterized by their emotional value to consumers, older people will be interested in sustaining

relationships to their favourite brands” (Evanschitzky & Woisetschläger, 2008, p. 631) Hence, the implications are far-reaching, the identification of those bonds provide an ‘early warning system’ for newcomers. As the loyalty threshold of the customer segment rises, a commensurate decline occurs in the readiness of the market segment for disruptive innovation or its ‘disruptive susceptibility” (Klenner et al., 2013, p. 914).

### 4.1.7.3 Collective cleaning conventions

While the general trend of cleanliness is moving upwards (Shove 2003), narratives about cleanliness are clearly drawn from and add to collective cleaning conventions. The narratives about doing the laundry are deeply embedded in conventions. Another innovation barrier (Ram & Sheth, 1989) is the way that norms and conventions guide cleaning practices. As an example, participant five was committed to a strict cleaning routine. She can be characterized as a “meticulous identity”, a term coined by Pink (2005, p. 123), as she criticized herself for what she saw as an excessive cleaning approach that she could not change: *“I am in my own way.”* As a result, she could not help re-doing tasks completed by a cleaning helper or her husband because their performance did not meet her standards. She expressed vehemently her dissatisfaction with the cleaner helper and the bad performance in cleaning the windows: *“but then it was streaky outside and badly done. Well, then, I will most likely change to a new helper.”* She described her husband as not competent to perform tasks to her standards. He was aware of his ignorance in domestic matters and declared himself ready to help on demand. However, she was not overly critical about his domestic role and preferred that he stayed out of this domain. In spite of not wishing to appear ‘over the top,’ she admitted that she was almost fanatical about cleanliness and tidiness: *“I used to iron even the underwear, but I don’t do that anymore, I just fold it”* (P5). Bourdieu (1990) identified knowledge as constructed within practice rather than passively recorded. The importance of the mother as a role model for learning conventions of a practice that affects usage patterns of technology was also mentioned by another participant (P8): *“This is so clear and obvious. My mom was exactly like I am today or HOW I HAVE BECOME. HOW I HAVE BEEN FROM THE VERY START.”* (P8)

These insights lead to an understanding of the social normative influence of practices (Bagozzi, 2007). To explore this construct further, a challenging laundry task was needed as ‘stimulus material’ or ‘discourse trigger.’ While talking about the removal of stains, it became obvious that practices can be viewed as a way to generate experience and knowledge, as in the following dialogue between mother and daughter regarding different strategies and detergent brands:

*She (P6): "No, I have just put on Persil, a bit of Persil on the stain and put it into the washing machine, it is gone."*

*Daughter: "I had difficulties. You still see a bit on my garment. I treated it with a stain remover, as I said, the one made by Ariel, the good one and then I soaked it, then I washed it and the stain is still visible a bit. It couldn't be removed completely."*

Sixsmith and Sixsmith (2000) referred to ‘shared norms’ as influencing needs:

The ways in which needs arise thus depend upon the individual, but are also driven by the norms shared with other people within their social group....technological solutions must adequately account for the full complexity of human experience if they are to be useful.

*(p. 192)*

The development of different types of special detergents influences conventions about how to clean. Thus, it generates a need for special detergents and influences the programme specification of the wash programmes (e.g., outdoor, silk) in the product development process. As such it affects the use of the machine:

*"Just because of all the products sold by the washing detergent industry, doing the laundry has become easier. For me now. I have special detergents for black clothes. I have a special stain remover which I use when there is a fat stain or I have white clothes where I know I just wash white things and then there is an extra detergent that makes or keeps them white. That is easier. In the past there was just Persil or Ariel." (P4)*

It appears that perfect clean laundry has become a central cultural ideal and part of normal life. Thus, the author adds collective cleaning conventions as a determinant affecting use patterns.

### 4.1.7.4 Family exposure to target media

In the media there is a high proportion of advertising about cleaning detergents, which increases cleanliness expectations (Shove, 2003). Clearly, 'perfect cleaning results' have become a normative, dominating concept in older people's life and is followed by many participants, as seen in the example of participant five mentioned earlier. As mentioned by Norman (1999):

A convention is a cultural constraint, one that has evolved over time. Conventions are not arbitrary: they evolve, they require a community of practice. They are slow to be adopted and, once adopted, slow to go away. So although the word implies voluntary choice, the reality is that they are real constraints on our behaviour. (p. 41)

But media also relates to the perception of product quality. A retired engineer (P9) underscored the importance of test results:

*"It is just like that with a washing machine. We explore the market...what are the ... special Stiftung Warentest reports and ask ourselves 'what are our needs?' and then we say: 'Ok, we take it and it doesn't matter if it costs 600 or 1000 Euros.'" (P9)*

Obviously, the media has a strong influence on conventions and what is perceived as clean or good quality. Furthermore, it relates strongly to the concept of trust and is highly relevant in a low-trust ecosystem, particularly in the purchase process (Chipchase & Steinhardt, 2013). That determinant will be incorporated into the determinant 'external communication'.

### 4.1.7.5 External technology access

The determinant 'external technology access' was discovered during the systematic literature review and is part of the use diffusion model of Shih and Venkatesh (2004), as previously explained.

#### **Validation and expansion**

Most participants had poor experiences with a dry cleaner. As a matter of fact, only a few participants discussed taking some of the laundry to the dry cleaner (P8, P4): *"We usually give shirts and pullover away. Good pullovers we give away, too, I don't do it myself."* (P4) However, most preferred to wash

themselves: *“I give only some pieces to the dry cleaning. I prefer to wash myself. Even my winter jackets filled with downs, I fill them with tennis balls and I wash them and afterwards they are perfect, just like new.”* (P8)

This determinant seems to be less relevant in affecting use patterns of the domestic washing machine, as dry cleaners have a reputation for ruining clothing and for being expensive. Thus, this determinant was rejected.

### 4.1.7.6 Environmental influences and factors

The determinant environmental influences and factors emerged inductively during the analysis procedure. Participants commonly felt that they benefitted from ‘fresh laundry’ if their laundry is dried outside in the garden and not in the appliance. Unsurprisingly, the weather played an important role in affecting dryer use (Pink, 2004, 2012; Shove, 2003; Shove et al., 2012). Most participants preferred to dry the clothes outside in the garden when the weather was good. Schatzki et al. (2001) argued, “understanding specific practices always involves apprehending material configurations” (p. 3). In addition, recursivity is central to the notion of technology-in-practice. For many participants, good weather meant drying clothes in the fresh air and not wasting energy costs. A 70-year-old woman enthusiastically described the relative advantage of drying outside:

*“Fresh. Fresh, really fresh bed linen that has been dried outside is three times as fresh as out of the tumble dryer. I used to put everything into the tumble dryer, everything. But with this machine..., laundry dried outside naturally is much nicer.”* (P4)

“Freshness,” as conventionally associated with qualities of air, has found its way into the practice of drying (Shove, 2003; Shove et al., 2012). Drying outside in the air was reported as having the meaning of freshness. The meaning and image of drying in the fresh air contradicts the image of the dryer as energy consuming. This is exemplified in the following comment (P1):

*“...., somehow it smells different. Fresher, somehow... the oxygen really changes the smell... and when you lay down in your bed, there is somehow something positive about it, when you smell the free nature, in your bed ....it smells better, ... there are fabric softeners with different smells, spring air or mountain air. Well that’s nice, it smells nice, but the fresh air smells much better.”* (P1)

From a social practice perspective elements are interrelated. As an example, one woman (P2) explained how drying outside helps to reduce a further task, ironing:

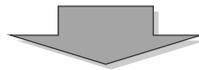
*“Yes, yes, I hang it up in the cellar. And I hang it up outside. No I don’t put that in... And it is really great to dry outside, in the sun, and what is best, if it is windy, it gets quite smooth. If it moves.”(P2)*

To get rid of stains, participant ten does not use technology alone. She uses the sun to get rid of stains: *“Make it wet and let it dry in the sun. Then it is extracted a bit, too.”* (P10) An unexpected result was that daytime was mentioned as an external factor influencing usage patterns (P12): *“We have off-peak electricity here and I turn it on at night, do I? So it has a timer and it practically runs at night. When I get up in the morning, everything is ready.”*

To sum up, to wash or dry is contingent on determinants relating to a multitude of external factors, rather than on individual choice. The interviews confirmed that cleaning conventions, the location of the appliance, and external factors like nighttime or good weather influence the usage patterns of the products and the practice of doing the laundry. Along with the location of the appliances, external factors like the weather provide a structure in which doing the laundry takes place.

**Table 32: Modified determinants (based on Shih & Venkatesh, 2004)**

		Determinants	Description and Explanation
Literature Review	External Dimension	<b>External communication</b>	<ul style="list-style-type: none"> <li>• A supportive social environment: speaks to neighbours and friends, uses social networks to talk about technology</li> </ul>
		<b>External technology access</b>	<ul style="list-style-type: none"> <li>• Use of technology outside the home influence the use at home, e.g., use of dry cleaner</li> </ul>
		<b>Family exposure to target media</b>	<ul style="list-style-type: none"> <li>• High exposure to media stimulates involvement with technology</li> </ul>



		Determinants	Description and Explanation
Modified Research Framework	External Dimension	<b>External communication</b>	<ul style="list-style-type: none"> <li>• A supportive social environment: speaks to neighbours and friends, uses social networks to talk about technology (affects both variety and rate of use)</li> <li>• High exposure to media stimulates involvement with technology</li> </ul>
		<b>Brand relationship (Aggarwal, 2004)</b>	<ul style="list-style-type: none"> <li>• Familiarity with and dependence on certain brand and product leads to 'social relationship' to brands and products affects both variety and rate of use. High emotional attachment to products.</li> <li>• 'Socialized member' of the family</li> </ul>
		<b>Shared cleaning conventions</b>	<ul style="list-style-type: none"> <li>• Following norms regarding cleaning standards affects variety and (mainly) rate of use. Perfect clean laundry has become a cultural ideal</li> </ul>
		<b>Environmental influences</b>	<ul style="list-style-type: none"> <li>• Weather (e.g., for drying) or daytime (energy saving times) affects rate of use</li> <li>• Image of freshness by drying outside</li> </ul>

### 4.1.8 Findings and implications of research stage 1

As stated before, technology is seen by many scholars as a key strategy to support independent living. However, a better understanding of older adults' usage patterns is crucial to maximize the potential that technology can provide to facilitate independence in daily life (Mitzner et al., 2010). With this in mind, the study explores the first research question (RQ1):

**RQ1: How are independent living and the influence of household technology perceived by the elderly?**

In the latest report *World Population Ageing 2013* by the United Nations (2013), it was mentioned that living independently is the main living form in developed countries. In the future, even more older persons will be expected to live independently. The primary findings provide a nuanced view of how independent living is perceived.

#### **Independent living under scrutiny**

In general, older adults associated independent living with quality of life and relate to emotional benefits like tranquility, flexibility, freedom, and individuality. These findings from the contextual interviews are in line with the general view of scholars that the quality of life is largely determined by an individual's ability to maintain independence (Gaßner & Conrad, 2010; Malanowski et al., 2008; Mollenkopf et al., 2010). However, it turned out that independent living should not be misunderstood as having freedom to choose in daily life. This is in contrast to concepts of capability enhancement (Nussbaum, 2011; Oosterlaken & van den Hoven, 2012) which emphasize freedom to choose. As such, practices offer a more realistic way to understand the social world (Nicolini, 2013). By taking a practice oriented perspective, the constraints of independent living became apparent. The primary findings emphasize the influence of habits, adherence to cleaning conventions, and structures in daily activities. This was also expressed by a strong attachment to home by all participants and the unwillingness to change the location of the appliances from the cellar to the living environment. *"I am in my own way"* (P5) was mentioned by one participant, which relates to the rigidity of conventions and structures of how and where to do the laundry. To a large extent, the primary data underline the

extent of influence resulting from manufacturers' 'scripts' on how to do the laundry. The emotional bonds to neighbours, brands or even to single artefacts, such as a washing machine ("*my girl*," P8), showed that participants seem to be 'captured in their own life script.' Those findings necessitate a new understanding of the concept of independent living. It requires a practice turn that shifts the perspective of viewing independent living from a purely individual view to a perspective on practices. Furthermore, the interviews did not confirm that older adults want to have autonomy (Malanowski et al., 2008). The results showed the opposite; it was more about "*to care for each other*" (P8) and sharing (P6). For this study, a practice-oriented lens relates independent living to the social, contextual situations, to habits and conventions and the embodiment, not in the sense of individuality, free choice and autonomy.

Conducting fieldwork in the homes of the older people helped the author to sketch a preliminary understanding of ageing-in-place and enriched the concept of independent living. The primary data gathered through participant observation and the expert interviews with two day care workers confirmed and extended the findings from the home interviews; independent living is a rather complex and multidimensional term.

- The day care workers reported about a different kind of 'independent living,' characterized in many cases by older ladies sitting at home alone, waiting for them.
- Often, the older adults referred to other people: their partner, their children, neighbours, and friends. They related to helping each other; it is more about interdependency and sharing.
- Smartphones and tablets provided a means for some older adults to 'stay connected.' Others rather preferred being part of the community, such as belonging to a church or religious group.
- Independent living also comprises independence from the partner, e.g., to have "*one's own savings account*" (P4) and to be able to "*write SMS to the daughter*" (wife of P7) are things that matter.
- Household technology influences ageing-in-place as it facilitates and sometimes even enables domestic practices. However, concerns were raised about any kind of technology that wants to 'script' the older user or tells them what they must do. 'Freedom of use' and products that adapt

to a different life-style are things that emerged highly significant from the home interviews.

Based on the primary data findings and field experiences, the concept of independent living must be enriched in a social sense. Accordingly, the first research objective (RO1) was achieved successfully:

**RO1: To understand the perception and the meaning of independent living by the elderly and the role household technology might play.**

Not a single artefact like the washing machine and its social implications was the focal point of attention. It was the practice of doing the laundry that lent meaning to technology. Rather than just optimizing the washing machine, the author researched the ecology of practices and how doing the laundry is embedded in the system of practices. Understanding the job (Christensen & Raynor, 2003; Goffin et al., 2010) that the older people are trying to get done puts an emphasis on the deconstruction of a target practice. In this way, the author identified the influence of cleaning conventions, structures in which doing the laundry takes place, and moral values. As a consequence, the author questions the taken for granted assumptions that underpin the liberal view of independent living that suggests to be free of choice or liberated from any dependency. Therefore, the term ageing-in-place is preferred, rather than autonomy as it associates too much freedom of choice.

For the second research question (RQ2), it was necessary to gather and validate the determinants of technology use by older adults:

**RQ2: What are determinants that affect use patterns of household technology?**

To get a better understanding of use patterns, the author explored the 'realities' of domestic life, the practice in situ. The study follows the assumption of Shih and Venkatesh (2004) who suggested that different usage patterns result in different levels of interest in future technology acquisition. Related to this study either sustaining or disruptive innovations are considered. Peine and Neven (2011) warned that the product development for older persons should not be overly directed to user needs. This is in line with Verganti (2009) who suggested that for product development the creation of new meaning does result from user

needs, but in relation to the world around him/her. By taking a practice-based lens focusing on habits, routines, and conventions, the author acknowledges that meaning takes place on different levels. As such the study attempts to balance an excessive concern with user needs (Norman & Verganti, 2012; Peine & Neven, 2011; Verganti, 2009) which is also in line with aspects of engaged scholarship (van de Ven, 2007) that advocates a stakeholder approach. The primary data underline that research needs to go beyond gathering user needs.

### **Dimensions and determinants**

At first sight, operating a washing machine seemed to be part of a chain of well-ordered physical activities: storing the dirty laundry, carrying the laundry basket to the washing machine, filling detergent in the drawer, loading and starting the machine, taking the clean laundry out, drying it in the air or in a dryer, and eventually doing the ironing. The participants mentioned all of these steps in their diaries and the contextual interviews. All the participants clearly stated that they did not want to give up control over the process. The narratives of the older people about doing the laundry and the product demonstration confirmed Shove's statement (2003) that "there is...more to laundry than setting the machine to run, and still much scope of customizing the process as a whole" (p. 403). The contextual interviews confirmed that doing the laundry is "ubiquitous, always on the agenda" (Kaufmann, 1998, p. 8) and is "interwoven with other practices of daily life" (Pink, 2012, p. 82), which includes dressing and going out. Surprisingly, the participants stated in the contextual interviews that doing the laundry today was not much work. At a second glance, the author obtained a different, more nuanced picture of determinants affecting technology use. The author deconstructed the practice by asking the participants to demonstrate the activities involved in doing the laundry. By moving through the home with the older people, the author 'deconstructed' the actual practice to get a sense of the laundry path, the physical burden to carry the laundry basket into the cellar, the narrow staircases, the lighting in the obscure cellar, obstacles, work-arounds and smells. To deconstruct laundry practices in this way helped to understand that all four dimensions (household social context, personal dimension, technology dimension, external dimension) affect the accomplishment of the practice and technology use. This way of viewing

laundrying and technology use has implications for the conceptualization of innovation and intervention. Instead of an overly concern with user needs (Peine & Neven, 2011), a multi-dimensional perspective is required including the relationship of elements of a practice. Although steep staircases were in many cases an issue (P1, P2, P3, P4, P5, P10, P12, P13), participants were emphatically opposed to change the location of the washing machine from the cellar to the living environment because it would change the existing laundry practices in a disruptive way. Thus, the study suggests that technology needs to fit into these arrangements, rather than reordering or replacing existing arrangements and structures with new appliances (Gomez, 2015).

Furthermore, the discourse with the older people was used as a 'Trojan horse' (Shove, 2003) to understand "the significance of social relations of laundry practices" (Pink, 2012, p. 77) and the living realities of the older people. It underlined that older female participants provided a repository of skills and knowledge in doing the laundry as exemplified in narratives about 'getting rid of stains.' Their use patterns of the washing machine affect the practice of doing the laundry and doing the laundry as a practice is affected or 'scripted' (Akrich 1992; Peine et al., 2014) by the technological dimension of the appliance. This "recursivity is central for technology-in-practice" (Feldmann & Orlikowski, 2011, p. 14) and clearly shows that household technologies, like washing machines, are embedded in practices and can not be meaningfully analysed in isolation without understanding them as a technology-in-practice (Feldmann & Orlikowski, 2011). Most importantly, by using a practice-oriented lens in doing the laundry, the approach goes beyond gathering user needs (Peine & Neven, 2011). Several social, personal, and external determinants have to be taken into consideration as influencing the use patterns of technology. The initial research model was created as an extension of the Use Diffusion model developed by Shih and Venkatesh (2004). In Table 33 (next page) you find the preliminary list of coding categories, which was used as a starting point for validation and further refinement.

**Table 33: Development of determinants**

	Original list of determinants (Shih & Venkatesh, 2004)	Initial list of determinants (after literature review)	Revised list of determinants
Household Social Context	Household communication	Household communication	Household communication
	Competition for limited resources	Competition for limited resources	Deleted
	Prior experience with using technology	Prior experience with using technology	Prior experience and habits
			Socio-technical arrangements (Chen & Chan, 2011; Bagozzi, 2007)
Technological Dimension	Technological sophistication	Technological sophistication	Technological sophistication
	Complementary technologies	Complementary technologies	Complementary and competing activities
			Price value (Bagozzi, 2007; Venkatesh et al., 2012)
Personal Dimension	Use innovativeness	Use innovativeness	Use innovativeness
	Frustration with technology	Frustration with technology	Frustration with technology
		Life course (Chen & Chan, 2011; Mathur et al., 2005)	Life course (Chen & Chan, 2011; Mathur et al., 2005)
		Technical self-efficacy (Chen & Chan, 2011; Norman, 2013; Rogers & Fisk, 2010)	Technical self-efficacy (Chen & Chan, 2011; Norman, 2013; Rogers & Fisk, 2010)
			Selection, optimization, compensation (SOC) (Baltes & Baltes, 1989; Fozard & Wahl, 2012)
External Dimension	External communication	External communication	External communication
	External technology access	External technology access	Deleted
	Family exposure to target media	Family exposure to target media	Deleted (integrated in external communication)
			Brand relationship (Aggarwal, 2004)
			Shared conventions (Shove, 2003; Shove et al., 2012)
			Environmental influences (Shove et al., 2012; Pink, 2004)

Accordingly, the second research objective (RO2) was achieved successfully:

**RO2: Gather and validate determinants affecting use of household technology.**

To provide better transparency regarding how the categories emerged, the author used a profile matrix (Kuckartz, 2012) as a means to provide an overview per case (participant) about important comments. The profile matrix (see Appendix 5) summarizes comments regarding independent living and dimensions/categories affecting use patterns in a systematic way. It provides quotes as 'anchor examples' per category and interview participant.

**Implications of research stage 1**

As similar to practice-base studies that focus on the 'doings and sayings' (Schatzki et al., 2001), Christensen et al. (2009) declared that the job a customer has to accomplish should be the core interest of marketing analysis. Daneels (2004) argued that the real challenge to any theory is how it performs predictively. The main contribution of Shih and Venkatesh (2004) to the other technology acceptance models in the field is the identification of a fourfold typology of user patterns (see table below). That typology is the primary reason for using the model in this research. The author suggests that different usage patterns predict different inclinations in adopting sustaining or disruptive technologies. By using this approach for this particular study, the segmentation problems mentioned by Christensen et al. (2009) are overcome because the approach is clearly 'job' oriented, not product-oriented. Shih and Venkatesh (2004) categorized users in intense, specialized, non-specialized, and limited use based on two distinct elements: variety of use (high and low) and rate of use (high and low). Following this approach underlines that the older market is a diverse segment with different user characteristics.

Table 34: User typology (Shih &amp; Venkatesh, 2004, p. 60)

		Typology	
		Intense	Non-specialized
Variety of use	high	Intense	Non-specialized
	low	Specialized	Limited
		high	low
		Rate of use	

To Shih and Venkatesh (2004), variety of use assumes a slightly more central position because it is one of the key elements of use innovativeness. It also plays a significant role in identifying intense users. In terms of the segments, intense users seem to dominate other users because of the number of features and programmes they found to be significant. Shih and Venkatesh (2004) suggested that this shows that a critical factor is how involved consumers are in the use of a product in terms of variety of use and rate of use. Based on that context, “intense users may be considered use innovators par excellence because they score high on both variety and rate” (Shih & Venkatesh, 2004, p. 69). The authors also found that users with a higher usage level are more satisfied with the current innovation and are also more interested in adopting futuristic technologies. That could be linked to the “lead user” concept identified by von Hippel (2005). Shih and Venkatesh (2004) stated: “We find that variety of use is not only an intuitive concept but a theoretically rich construct for application in new product development and design” (p. 69). The interviews have confirmed that ‘variety of use’ is strongly influenced by the use innovativeness of an older person which is shaped through earlier experiences in the formative period.

#### Limited use

This study defines ‘limited use’ as that of users who use the washing machine once a week or less, and use only a small variety of functionalities like wash programmes. Typically, participants who live alone have ‘limited use’ as their rate of use is low and their variety of use is low. The participants clearly stated that they have different demands of appliances now that they are retired and life

alone. Thus, life course emerges as a key determinant as changes influence both 'rate of use' and 'variety of use.' This seems to be particularly problematic when unforeseen life events occur. It appears that "most disruptions in social life are not deliberate ... but they disturb habitual ways of doing things" (Trentmann, 2009, p. 81). As mentioned by one participant (P2), in a pragmatic way, after her husband passed away: *"You have to change. It is like that"*. (P2)

The death of her husband affected almost all parts of life, including her weekly shopping. In addition to changing her food purchasing habits, doing the laundry changed because a single household predictably produces fewer wash loads. The woman stated that she collected dirty laundry for 10 to 14 days as she was alone, which resulted in limited use of the washing machine after the death of her husband. For example, a 75-year-old woman (P13), who lived alone, wondered in her diary about the ways how washing technology could assist her to continue doing the laundry: *"I always think the same: If only I had a washing machine that could wash little amounts of laundry economically."* In the following quote, she explained that she was not willing to wash small loads, which waste energy and money.

*"Some things lie around too long. I think it isn't enough to wash already, so I just put it away, because I think that it is a waste of energy and money to wash such small amounts in a big washing machine."* (P13)

Unsurprisingly, limited use has been observed for single older woman, but is not necessarily limited to them. The 'limited use' pattern is in line what Christensen (2013) addressed: customers exist who demand fewer functions and are satisfied with adequate performance. The primary findings indicate that the ideal group for low-end disruptive innovation are users with a low rate of use and low variety of use. Typically, that segment is comprised of single older women from the 'early technological generation.' They use the machine less often and prefer to stick to well-known features. Thus, limited use is associated with low-end disruption in the following section.

### Specialized use

Past experiences of washing clothes may still affect current usage patterns: a 78-year-old said she preferred hand washing even if this causes irritation of her

children: *"I have a lot and I wash that by hand. They all laugh at me, right?" (P3)* Against this background, it becomes clear that specialized use may not result in heightened interest in new and advanced technologies because they usually do not want to break their habits and routines. For some participants, doing the laundry and operating the washing machine had a high impact on daily life, which confirms Kaufmann's (1998) view who underscored the impact of laundry on daily life. As this frequent washing actually requires a lot of work and organization, it is interesting that only a few participants complained and/or questioned the amount of work involved. One reason is the social significance of dressing and the outer appearance, which influence the identity and well being. One participant (P10) related doing the laundry to clothes and well-being: *"Neat clothes are very important to feel comfortable" (P10)* One reason for the low variety of use is that many older adults still mistrust the washing machine when it comes to more delicate clothes like woollens. Here the technological dimension is a key enabling determinant affecting 'variety of use.'

The life course has a strong influence on the 'rate of use'. As expected, couples have a higher frequency of use than single individuals. However, the perception can be different. The following statement emphasizes that power and social relationships are involved in practices (Hargreaves, 2011):

*He: "We do the laundry too often. She does it too many times.  
(laughs)"*

*She (P11): "I don't do the laundry too much!"*

To sum up, specialized use was a very frequent pattern observed in the research. All in all, this segment provides opportunities for new market innovations.

### Non-specialized use

The non-specialized use pattern results in a high interest in new technology and could be confirmed for a few participants (P1, P4, P11). One main explanation for the rejection of low price washing machines and the assumed lower quality lies in the important task the washing machine has to fulfil. Mainly in caring for valuable clothes:

*“My pullovers made of cashmere all cost around 200 Euro and they have to be good. I have to get out everything, haven’t I? Therefore a woollen programme is important for me. And silk, too.” (P4)*

### Intense use

A socially active 69-year-old man (P1), who was a capable and very enthusiastic computer user, expressed interest in a washing machine with smartphone connection to monitor the process of the wash programme when he is outside of the home. He can be best described what Peine et al. (2014) termed an “innosumer,” which describes a user who considers available options and evaluates them in terms of how well they might contribute to their life-styles. They can be described by a generic interest in and knowledge about technology. During the narrative, participant twelve realized how much work and prior planning is really involved and that it is not the usability of the technology alone that matters (P12):

*“I do the laundry nearly every day, I don’t care. If it is a Sunday or a public holiday. It just isn’t any work. I put on the machine. Doing the laundry today is no work at all. It just goes into the machine and then shortly into the dryer and I hang it up in the ‘drying room’. So I just dry it shortly, so that it is a bit smooth, so the underwear and so on. Yes and then I hang it up. That is something I can also do on a Sunday.” (P12)*

Today, she does the laundry whenever she likes, every day if required. She recalled it was a very different and annoying task when she reflected on what it felt like 50 years ago. There was a set laundry day once a month that involved the whole family and included the help of an external laundry helper. Today, the whole burden has shifted to her. This interview extract shows that a more nuanced discussion about usage patterns is required that goes beyond product usability issues.

To sum up, the typology by Shih and Venkatesh (2004) was taken as a basis to determine the formation of user segments. The responses of the contextual interviews helped to enrich user representations by identifying different usage patterns. Understanding the usage patterns and the affecting determinants is a preliminary step to distinguishing different user segments and a pre-requisite for new product development. The fourfold typology of users is employed as a way to visualize market diversity.

### **4.1.9 Modifying the initial conceptual framework**

The initial research model was created as an extension of the Use Diffusion model developed by Shih and Venkatesh (2004). It offered a preliminary list of coding categories which was used as a starting point for further refinement. The research confirmed all of the four dimensions (household social context, technological dimension, personal dimension and external dimension) that were established in the original model by Shih and Venkatesh (2004). Each of these dimensions consists of pre-defined subcategories (determinants) affecting usage patterns. In a first step, by reviewing and analysing the literature (see Chapter 2), new determinants were added to the existing ones. Life course and technical self-efficacy were identified from the literature review as important determinants explaining age-related differences in technology use. Those specific determinants were added in the initial model to the personal dimension of the original model and have been validated in the research. In a further step, determinants from the original model were adapted (e.g., complementing prior experience with habits). The determinants that were not confirmed in the research were deleted (e.g., external technological access). In a further step, during the course of deductive-inductive text analysis, new determinants (e.g., price value) emerged inductively from the data and led to a refined model (see Figure 31). A closer inspection of the usage patterns offers a more specific understanding. Older, single women approaching the “Fourth Age” show patterns of a ‘limited user,’ which seems to make them predestined for (low end) new market disruptive innovations. This has implications for innovation strategies and the technology dimension because it is not “pushing for perfection” (Anthony et al., 2008, p. 8), but for good enough at a reasonable price. From the results of the systematic literature review and the analysis and discussion of the primary data gathered by the contextual interviews and observations, the conceptualized model was refined in order to reflect the current progress of research. It also visualizes how much clearer the path to outcome driven innovation (Bettencourt & Ulwick, 2008) can be when companies guide the research and development to the ‘customer job.’ The revised conceptual framework guides the further research.

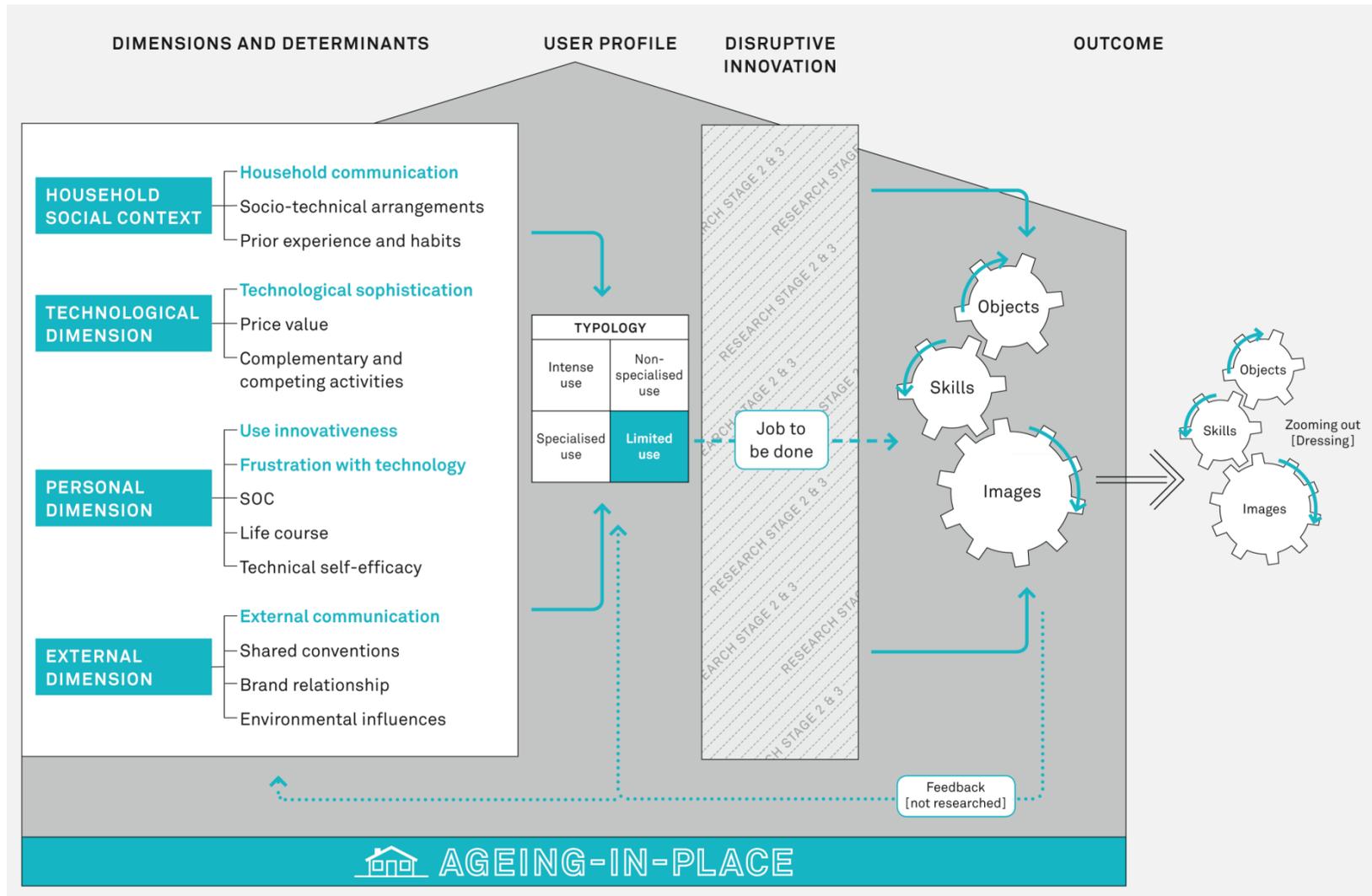


Figure 31: Modified initial conceptual research framework (based on Shih & Venkatesh, 2004 and Shove et al., 2012)

### **4.2 Research stage 2: Identifying areas for disruptive innovations**

As shown in the home interviews, the following factors have far-reaching implications for use patterns and innovation management: the wish to maintain the status quo, to keep the stability of routines, to preserve habits and relationships with persons and products, and to stay in a well-known secure structure. With these fundamental implications for the application of Christensen's (1997, 2013) theory in mind, the research intends to identify focus areas in the domestic domain of innovation action.

The primary data indicate that disruptions in social life (Trentmann, 2009) and life changing events (Mathur et al., 2005), in particular, affect use patterns and provide opportunities for disruptive innovations. If older adults with 'limited use' patterns demand new products and services in a more convenient, simpler, and affordable way, then disruptive innovations could provide a clear consumer benefit and a strong value proposition. As opposed to Shih and Venkatesh (2004), the main outcome of using a specific technology is seen in the accomplishment of completing domestic jobs, which is a clear consumer benefit and stronger value proposition because "the new product will succeed to the extent it helps customers accomplish more effectively and conveniently what they're already trying to do" (Christensen & Raynor, 2003, p. 93).

The primary data findings and the identification of 'limited use' patterns in combination with a high brand loyalty have far-reaching implications for the application of disruptive innovations because "older consumers might simply not consider emerging alternatives" (Evanschitzky & Woisetschläger, 2008, p. 631), which could present a difficult obstacle for newcomers trying to enter this segment. Those results are clearly beneficial for established brands; however, they seem to spoil any initiatives of newcomers or start-ups to enter this market as recommended by Christensen and Raynor (2003). As it appears, following a low-end disruption trajectory to attack established companies is predicted to fail with regard to the segment of older consumers. For these newcomers, the key challenge will be to overcome brand loyalty and to get into older consumers' minds (Evanschitzky & Woisetschläger, 2008).

### **4.2.1 Planning, conducting, and analysing expert interviews**

In a further research step experts from different disciplines were consulted to obtain their perspective of that phenomenon, particularly on the diversity of the segment. In a social constructionist research approach, a research interview is not a neutral fact-finding activity (Easterby-Smith et al., 2008; Maxwell, 2013); it is characterized by ‘encounters’ between people and interactions in which experiences and meanings are created (Steen, 2008). The author defines experts as persons who have special knowledge about the phenomenon under study (Easterby-Smith et al., 2008; Meuser & Nagel, 2002) and are particularly responsible for the development and implementation of strategies or policies concerning ageing (Ehret, Jacobs & Wozniak, 2013). By conducting expert interviews, the author wished to triangulate the findings from the interviews with older adults and enlarge the understanding of the living situation and practices of older adults, with particular regard to the diverse contexts and meaning of technology.

#### **Sampling strategy**

In total, the author interviewed experts from various disciplines mainly by telephone or face-to-face interview that lasted approximately one hour. By using the snowball method, it was possible to construct a chain of relevant interview partners that knowledgeable in the fields of ageing, care for older adults, and independent living. The interviewees were chosen based on their expertise relative to the subject of this thesis. As the study has an interdisciplinary nature, the interview partners were deliberately selected from a variety of backgrounds, which helped the author to expand the view on the phenomenon.

The author received official permission to contact the members of an organization engaged in voluntary initiatives to support the elderly with technology. These participants work on a voluntary basis as technical coaches and provide peer-to-peer support for older adults in various fields of application such as smartphones. The following table provides an overview of interview participants, their background, and current activities. The same strict ethical proceedings were followed for this research stage (see section 3.6). After informed consent was given, all interviews were audio recorded. Six of those interviews were transcribed; exhaustive field notes were written for the others.

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Anonymity was assured in all cases, participants were assigned as EPx for expert participants and given an identifying number.

**Table 35: Sampling structure of expert interviews**

<b>Participant</b>	<b>Current Profession Background</b>	<b>Interview type</b>
EP1	Scientific assistant Faculty of design at University	Face-to-Face
EP2	Designer Faculty of design at University	Face-to-Face
EP3	Managing director Architect	Face-to-Face
EP4	Doctor General medicine and hospice	Face-to-Face
EP5	Technical coach	Telephone
EP6	Technical coach	Telephone
EP7	Technical coach	Telephone
EP8	Technical coach	Telephone
EP9	Technical coach	Telephone
EP10	Technical coach	Telephone

### **Discussions and analysis**

The author developed and used a topic guide (see Appendix 11) that addressed themes of independent living. Those themes included inquiries regarding the quality of life, domestic practices, and the role of household technology and were characterized by questions such as: “What is the meaning of home for older adults?” and “How could technology support older adults in their wish to stay at home?”

Maintaining or enhancing independence is a common aim of technologies designed for older adults (Mollenkopf et al., 2010; Peine & Neven, 2011; Thielke et al., 2011). However, the interviews with the day care workers have shown that the mantra of “older-people-want-to-live-at home” (Peine et al., 2015, p. 4) could have negative consequences. This was confirmed by an expert who related independent living to bitter loneliness and social isolation.

*“You look at this bitter loneliness when you do such home visits. I have also done them, myself, for a couple of days. I am deeply impressed by the work of the day care workers, but at the same time also deeply moved because of the life some people are forced to live. On the other hand they have organized such a life for themselves. So that has moved me deeply. I could tell you about impressive scenarios, but I won’t do that.” (EP7)*

A general practitioner (EP4) extended the definition of independent living with the aspects of everyday life capability (“Alltagstauglichkeit”), which means to be capable to care for oneself:

*“Everyday life capability means...at least as long as possible to live independently, this means, to live in your own four walls and what is more to care for yourself alone.” (EP4)*

This statement confirmed the findings in the home interviews and the literature, which underline the importance to be able to organize everyday life (Jakobs et al., 2008; Loe, 2015; Mollenkopf et al., 2010). This seems to be highly relevant because, as the general practitioner mentioned, most of his patients prefer to stay at home until the final moment. In that circumstance, every day technology could help to prolong living a normal life:

*“...if ever, then at the last minute. So, I think that there will be such a time when your everyday life capability is limited in such a way that you are no longer able to do the simplest things. Simple things mean not only going to the toilet alone, but the simplest things, like to eat reasonably, to drink reasonably, to walk safely, not to fall, such things.” (EP4)*

He further declared that most of the accidents of older adults “*happen during housework*” (EP4). The wish to age-in-place in combination with a positive attitude towards the use of technology seem to be major indicators of technology use (Heinz et al., 2013; Mitzner et al., 2010; van Hoof et al., 2011). In the interview, the doctor regarded technologies that facilitate housework as helpful, but he added a criticism about technologies that lead to immobility and laziness, as they would be counter-productive in later life:

*“Well, every thing that makes my life easier is right for me and also... and also good. But it mustn’t lead to the case that the older person is not forced to move anymore. This is what worries me. See, the more tasks I take away from such a person, the less mobility the older person has.” (EP4)*

In a Foucauldian (1988) interpretation, manual housework was regarded by many older participants as means of self-care. As an example, an older man referred to his garden work (husband of P10) and stated that it takes him two hours to complete it. However, *"It gets longer every time, as I am not the youngest anymore."* He related this statement to his work in their huge, cultivated garden with old trees and grassland. His neighbour owns a robot lawn mover, a new technology, designed to facilitate domestic work. However, he fiercely opposed to use it as a means of self-care: *"I can do it myself, it keeps me fit."* This view is shared by many participants and is in line with Fänge and Ivanoff (2009) who explored health in relation to home, with participants aged 80 to 89 years old. They confirmed that physically and mentally demanding activities are still important in later life in order to be independent as long as possible. "For example, still doing the laundry or climbing the stairs just to stay fit means stretching one's physical limits" (p. 342). In the wash diaries and interviews, a retired teacher (P8) reported *"that doing the laundry is not an issue anymore."* Although anthropologically one might define laundry as a type of routine, in the view of this older lady (P8), her housework was not done as a mindless drudgery. Doing the laundry is an enjoyable, embodied experience and serves as her personal fitness programme. She (P8) described how she made housework serve her:

*"I don't think that housework is exhausting, I see it also as a kind of fitness programme. Except hanging up the laundry, I just hang it up. Then I stretch out my arms and move my arm muscles (laughs). But when I clean and I go along on my knees, I do certain moves that suit me. Also I love to work in the garden and combine that with movements that keep me fit and I enjoy that. I like the feeling of having reached something and that everything is neat, tidy and nice. If the laundry is ironed and in the cupboard, I like that. Yes." (P8)*

The overwhelming view expressed by the interview experts was that "self-reliance depends on their capacity to use domestic appliances" (Higgins & Glasgow, 2012, p. 333), which is exemplified in the following statement:

*"Yes, housework has a crucial role in this complex, if I want to live as long as possible in my own flat, then I have I also have to talk about housework, there are automatic vacuum cleaners and such things. This all plays a role." (EP8)*

Some experts (EP5, EP6) explained why many older people responded in the home interviews “not for me” when they were confronted with new technologies. Here technology use depends on aspects of use innovativeness, habits, routines, and the “fear” of trying something new and unfamiliar. Both experts come to the same conclusion:

*“I think people are afraid to start something new because some things always worked like this. They are used to it. So, I think, you should give ‘low threshold’ information to the older people, but provide more extensive information to the younger people.” (EP5)*

*“I really think that the most people are afraid of technology because they haven’t grown up with it.” (EP6)*

In this line of thought, the right communication strategy seems to be crucial, which necessitates a focus on the “*servicing function of technology*” as mentioned by one expert (EP8), who is in his late seventies.

To sum up, domestic practices are a means of self-care (Foucault, 1988; Grebe, 2013) in later life and a prerequisite to age-in-place. As a consequence, it is the accomplishment of the ‘doing’ that gives form and meaning to technology (Dourish, 2006).

### **4.2.2 A new market segmentation approach**

Unsurprisingly, this research confirms that “innovation resistance seems to be a normal, instinctive response of consumers” (Ram & Sheth, 1989). However, despite similar demographics, it seems to vary substantially in degree among older consumers. Consequently, this research suggests that age may not be adequate in explaining the usage or consumption behaviour. Yu and Hang (2010) suggested that it remains unknown whether there is a systematic way to identify new disruptive opportunities for applying existing technology or products. A product oriented segmentation approach is provided by Govindarajan and Kopalle (2006a). They offered a scale to assess the disruptiveness of innovations. However, the assessment is based on the perspective of the company and focuses on the capability to introduce disruptive innovation.

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**Table 36: Assessment of disruptive innovation  
(adapted from Govindarajan & Kopalle, 2006a)**

Item	Measure
1. How disruptive is your business?	In your opinion, how disruptive were your product launches during the past 5 years?
2. Rarely introduces disruptive innovation	The category of household appliances rarely introduces products that are disruptive in nature.
3. Lags behind in disruptive innovation	The product category of household appliances lags behind in introducing disruptive product innovations.
4. Attractive to an older customer segment	During the past 5 years, the new products that were introduced were very attractive to <i>the ageing</i> customer segment at the time of product introduction.
5. Mainstream customers found the innovation attractive	During the past 5 years, the new products that were introduced were those where the mainstream customers found the innovation attractive over time, as they were able to satisfy the requirements of the mainstream market.

The overview provides an adaption of the original framework of Govindarajan and Kopalle (2006a) to the product category of household appliances targeted at the segment of older consumers. It can be taken as a starting point for a deeper engagement in the evaluation of market opportunities. Based on the table, it is clear that Govindarajan and Kopalle (2006a) considered disruptive innovations mainly from the company's perspective (items 1 to 3) and did not pay enough attention to the customer perspective (item 4). Furthermore, the 'Disrupt-o-Meter' provided by Anthony et al. (2008) can be used as a diagnostic tool to scan potential start-ups and the disruptiveness of their value propositions. The tool was designed to evaluate the degree of disruptiveness of company offers to particular customer target segments with respect to existing solutions (including the lack of solutions associated with non-consumption). The adapted table below could be used as a tool to evaluate different business propositions, e.g., offered by start-ups. In the adapted table, the nine criteria are evaluated by choosing between one of three options corresponding to 0, 5, or 10 points. At the end, all points are summed up: the higher the value, the more disruptive the value proposition.

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**Table 37: Evaluation criteria (adapted from Anthony et al., 2008)**

Evaluation Criteria	0 Points	5 Points	10 Points
1 First-year target	Mass market	Large market segment	Niche Market
2 Elderly customers' opinion about the job to be done	Needs to be done better	Needs to be done less expensively	Needs to be more easily
3 Elderly customers' view on offer	Perfect	Good	Good enough
4 Elderly customers' view on price	High	Medium	Low
5 Business model	What has been always done	What has been always done but with a few tweaks	Radically different
6 Channel to market	Existing	At least 50% new	Entirely new channel
7 Competitors' urgency to do something	Willing to act as soon as possible	Willing to watch for any new developments very carefully	Do not care
8 Expected first-year revenue	Large	Average	Small
9 Required investment over next 12 month	Above average	Average	Below average

Both assessment scales are not sufficient for a “diligent clarification” (Herstatt et al., 2011, p. 10) of the target group and can be used only as a starting point to explore the opportunities and challenges for entering this emerging segment. However, it requires a better understanding of which type of innovation strategy is the most appropriate for the different submarkets. The literature review indicated that more accurate mental user representations are crucial to avoid stereotypes and ageism (Lew et al., 2015; Steen et al., 2014). To Steen (2008) having no particular person in mind is likely to result in what Norman (2013) terms ‘feature creep’ because the designer imagines all sorts of possible situations that may happen. Imagining a specific user would prevent such overloading of unnecessary functions and would lead to specification that is guided by “good enough can be great” (Anthony et al., 2008, p. 8). The research should provide a framework to develop products that respects the diversity of the segment of older adults: “understanding specifically who the

user is can have an important influence on a given technology's acceptability to that user" (Morris and Venkatesh, 2000, p. 398). The author suggests that different usage patterns predict different inclinations in adopting futuristic technologies. However, the current typology with the segmentation of intense use, specialized use, non-specialized use, and limited use can provide only a rough orientation to designers and product managers as life-style aspects are missing. For innovation strategies to be successful, experts (EP3 and EP5) recommended dividing the segment into two 'technological generations':

*"You have to think about the two senior generations when talking about the demographic development. I talk about the younger senior generation of about +- 60 to 80 and the older 80 plus." (EP5)*

As a next step, the typology by Shih and Venkatesh (2004) was extended further by applying the persona concept of Glende et al. (2010), in order to provide richer insights of user representations (see Figure 32). The research found that there are factors that have a significant impact on one's behaviour like certain experiences in life (Mathur et al., 2005). These life-event experiences seem to be better predictors of consumer behaviour than segmentation models based on age or cohorts due to the person's need to enact new roles (Mathur et al., 2005). In this line of thinking, it is proposed that life events lead to role transitions which create stress and require adjustment of life-styles (Mathur et al., 2005). Following this expert suggestion, the persona profile is categorized in persons belonging to the younger generation ('society of household revolution') and older generation ('early household generation') based on the distinction provided by Sackmann and Weymann (1994). In the following section, the author has enriched the typology of Shih and Venkatesh (2004) with the primary findings from the research and extended it with the general approach of personas by Glende et al. (2010). In order to stimulate empathy and to identify disruptive innovations, it was essential to transfer the user typology into a more realistic situation by adding life-style aspects. Therefore, the author transformed the typology and created personas based on the additional primary data findings and the 'job-to-be- done' of doing the laundry.

The home interviews clearly showed that the participants have different demands of appliances now that they are retired and live alone. Thus, they

indirectly related the demands of the appliance to certain life events and the changed life stage. As an example, whereas the demographics (age, gender, etc.) of the personas 'Susan' and 'Elisabeth' do not differ dramatically; they have different life-styles and inclinations towards new technologies (see Figure 32). Slater and Mohr (2006) linked Rogers' adopter segmentation with Christensen's different strategy types. Basically, this research takes a different approach: it links the user segmentation typology created by Shih and Venkatesh (2004) with different strategy types. This approach represents the foundation for matching the selected target market segment with the most efficient market strategy, which is either sustaining or disruptive innovation. In concrete terms, this research suggests that consumer insights about usage patterns in combination with life stage descriptions are better predictors of innovation adoption than segmentation models based on (chronological) age (Venkatesh et al., 2003), cohorts (Yoon, Cole, & Lee, 2009), or adopter categories (Rogers, 2003).

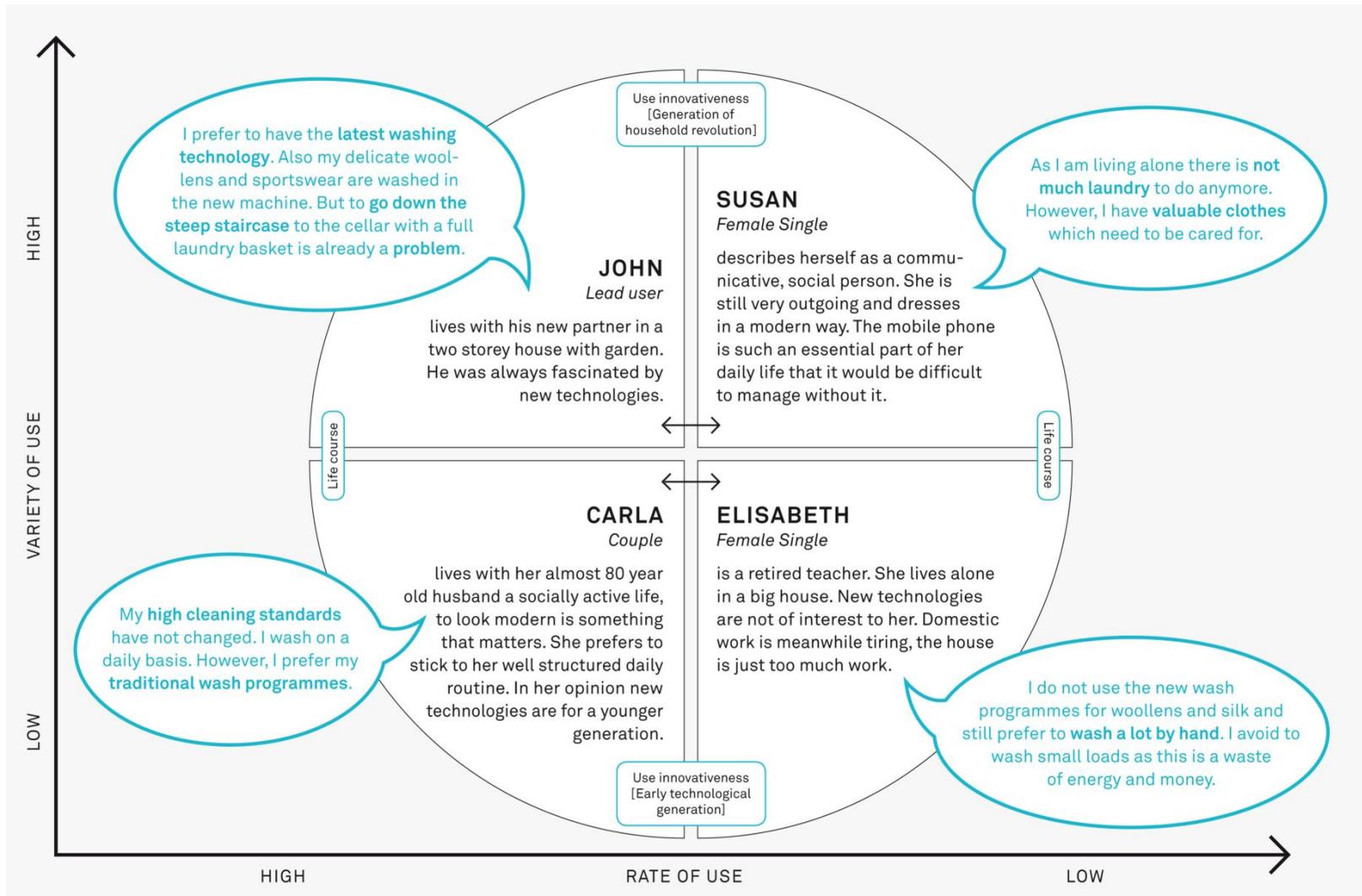


Figure 32: New market segmentation approach (based on Glende et al., 2010 and Shih & Venkatesh, 2004)

### 4.2.3 Planning, conducting, and analysing focus groups

Based on the literature review, it can be asserted that innovation and product development for older customers is still at an early stage (Herstatt et al., 2011; Kohlbacher et al., 2014; Lew et al., 2015). Most of empirical work on disruptive innovation was “case-based and qualitative in nature” (Yu & Hang, 2010, p. 18). The application for an ageing market was explored through case comparisons of various gerontechnologies or age-friendly products like mobile phones, notebooks, electric bikes, robot suits, etc. (Kohlbacher & Hang, 2011; Levsen & Herstatt, 2014). “Autonomy-enhancing solutions – improved or totally new products and services addressing this need for autonomy – can help to fill the perceived gap between a low (er) and a desired state of autonomy, at least for some time” (Herstatt et al., 2011, p. 5). Those studies included interviews with entrepreneurs and managers to collect data (Kohlbacher & Hang, 2011; Kohlbacher et al., 2014; Levsen & Herstatt, 2014). Basically, all studies had the aim to better understand the implementation of more affordable, easier to use products which enhance the autonomy or independence of older adults (Herstatt et al., 2011). Various promising cases were investigated that should lead to autonomy enhancement and a triple-win situation for older adults, policymakers, and companies (Neven, 2010; Peine et al., 2015). However, from the author’s point of view the accomplishment of this triple-win situation is disappointing because these products are still ‘trapped’ in a market niche. Part of the disappointment seems to come from methodological shortcomings of case-based studies and the focus on gerontechnologies. Considering the importance of the customer group, it is surprising that for opportunity recognition (Kohlbacher et al., 2014) only a few studies were found that included the direct participation of older adults in the concept development phase (Leonardi et al., 2008; Renaud & van Biljon, 2008). This thesis is different as it uses focus groups with a direct participation of older users to explore the autonomy enhancement of (future) everyday technologies (Jakobs et al., 2008; Loe, 2015), not on gerontechnologies. To achieve a shared understanding about the possibilities and challenges of technologies, personas and scenarios were recommended by scholars (Kohlbacher, 2008; Lew et al., 2015; Steen et al., 2014). Personas and scenarios are a direct countermeasure to lower the impact of cognitive, social distance between researchers and older (‘distant’) target

groups (Lew et al., 2015). This thesis differs from the case-based studies mentioned above because it is based on a practice-oriented perspective for the integration of disruptive innovation in daily routines. This research closes a methodological gap by exploring new everyday technologies to be integrated in future domestic practices. This approach underpins the idea that innovation can come from the interconnection of practices and their linked elements. However, innovation can also emerge from new arrangements of elements and new ties that are made or broken between elements (Pink, 2012; Shove et al., 2012). In principle, practice theory is directed toward 'what is' and 'what was' (Kuijjer & DeJong, 2011). However, when it is incorporated into an innovation approach, future practices will emerge.

Although the author did not follow a case study in the traditional sense (Yin, 2009), the author opted for multiple cases in order to explore differences across product categories and advocated for the direct participation of older adults in the evaluation and assessment. The overarching theme of the scenario presentation in focus groups was to identify opportunities and barriers for new products and services to support ageing-in-place of the older people. For the evaluation of the real-life cases that were selected, two aspects of autonomy enhancing were considered, which follows the approach of previous works by Herstatt et al. (2011). The first relates to the usability, which is a more general precondition. It was discussed whether the presented products could be used independently by older adults, i.e., without help of family members etc. The second aspect is more comprehensive and concerns the value proposition of the product. It relates primarily to the extent that product assists with a domestic job, e.g., regaining the ability to do the laundry or to cook. As the potential gain of independence in accomplishing a practice grows larger, a corresponding increase occurs in the value proposition for the target customer (Herstatt et al., 2011). These two very different types, which are not mutually exclusive, are discussed through user scenarios within the objects-skills-image framework (Kuijjer & DeJong, 2011; Shove & Pantzar, 2005).

### **Sampling strategy**

The participants were recruited from a social organization, which was supported and organized by the local authorities. The focus groups were conducted in a familiar location, the Parish Hall of the community. After the authorities granted

## 4 ANALYSIS AND DISCUSSION

permission, information about the study and the purpose were disseminated to individuals requesting participation. Before the focus groups commenced, each participant was asked if they agreed for the discussion to be audio-recorded. They were also asked to complete and sign a consent form, which assured anonymity and confidentiality. The participants were reminded that they could withdraw from the study at any time without having to give a reason.

**Table 38: Overview of participant sampling structure (focus groups)**

Focus Groups	Date	Location	N	Age span		Average Age	Gender		Household Size		Available Appliances	
				Min.	Max.		Female	Male	Singles	Couples	Washer	Dryer
<b>FG1</b>	19/11/2013	Parish Hall	7	70	87	78	7	0	7	0	7	1
<b>FG2</b>	13/12/2013	Parish Hall	7	66	80	73	5	2	5	2	7	3
<b>FG3</b>	13/6/2014	Parish Hall	7	69	76	74	7	0	7	0	7	2
			<b>21</b>	<b>66</b>	<b>87</b>	<b>75</b>	<b>19</b>	<b>2</b>	<b>19</b>	<b>2</b>	<b>21</b>	<b>6</b>

In the focus groups, the author acted as moderator and coordinated the discussion of participants. He was accompanied by his wife who acted as an ‘assistant’ and helped the older people during the focus groups with organizational issues when required. On request of the moderator, a representative of the organization was present through all of the sessions as a ‘silent observer.’ The data gained by focus groups are displayed as FPx for participant whereby the ‘x’ is the number of the participant in the focus group. None of the participants lived in an assisted living or nursing home environment. The moderator used a focus group topic guide as the main guideline throughout the sessions (see Appendix 13). This was a list of tasks/stimulus questions to be covered during the focus groups, although this was not adhered to a strict manner. The main aim was to get the participants to speak freely about their views on household practices.

### **Product cases**

Anthony et al. (2006) underscored that researchers need to pay attention to the circumstances in which a job is conducted, the performance objectives of the customer, the barriers and work-arounds to get the job done, and the solutions that the customer considers. A major requirement for the selection of use cases was to include technologies used in the home environment to get a specific job done. The second criterion refers to household technologies that are meant to 'integrate' user tasks or process steps, thus reduce the workload in getting the job done. Following these key requirements home technologies were selected that serve assistive purposes in conducting daily domestic activities. A third selection criterion was that the products are already available on the market, not prototypes. A range of smart domestic appliances were selected as they are often promoted to offer comfort, safety, and security solutions in the home, which seemed to be highly relevant in older age (Gaßner & Conrad, 2010; KPMG, 2014; Mollenkopf et al., 2010).

### **The process**

The moderator informed the participants about the modus operandi which included informed consent and ethical aspects. In the warm-up phase, the moderator started with an introductory round and with open questions about household tasks in general. In a next step, the discussion was guided to the activities involved in doing the laundry, likes/dislikes in doing the laundry, and changes during the life course. The main part revolved around user scenarios. Typically, the presentation of the user scenario started with a short description of the persona and a domestic practice in which a fictive user is not able or limited to do. In the scenarios, the use of personas and storylines provided a context for understanding and envisioning older adults' needs and preferences (Leonardi et al., 2008; Steen et al., 2014). Each scenario was presented in consecutive order and read aloud by the moderator in front of the group.



**Figure 33: Presentation of personas**

The storylines were meant to help the participants to reflect on daily domestic practices and the use of technology in a specific fictive situation. All the personas and scenarios were derived from the findings from the contextual interviews and were validated in advance by expert interviews to maximize efficacy. A group interactive scenario analysis was used to jointly discuss the situation and possible solutions (Leonardi et al., 2008). In a first step, participants were asked to speak about the verisimilitude of the persona, which was confirmed in all cases as credible. In a next step, they were encouraged to freely state possible technological and non-technological solutions to the presented situation and problem. Afterward, a product was presented that was meant to assist the persona in daily activities and was intended to provide a solution to the presented problem. These examples of real life product cases were presented for 'joint inquiry' (Steen et al., 2014). Each product solution was meant to facilitate the current routine of daily activities of the persona. In order to keep participants focused and to facilitate turn giving, participants were assigned a concrete task: they were encouraged to express their opinions about the general idea and functionality of the product with respect to ease of use and perceived usefulness for the persona. The author collected the feedback on cards and placed them on the storyboard. When the participants had finished providing feedback, the storyboard was placed on the wall and was visible for the whole group (see also Appendix 1).

After the feedback part was completed, the next persona and storyboard was introduced. In the final stage, after all scenarios had been presented and placed

on the wall next to each other, the moderator handed out blue ('like') and red ('dislike') stickers for appreciation of the technological solutions, for scenario evaluation, and a final group discussion (see also Appendix 1). The focus group ended with a feedback round about the organization and methodology of the focus group session.



Figure 34: Impressions from the focus groups

### 4.2.4 Validating and expanding the initial model with focus groups

In the following, disruptive innovation research was directed to the images-skills-objects framework (Kuijer & DeJong, 2011; Pink, 2012; Shove & Pantzar, 2005), which was used to guide the analysis and discussion about different technologies. The presented cases were related to laundry care ('wall mounted washing machine,' 'washer dryer combination,' and 'automatic dispensing programme') and to other domestic practices ('smart fridge,' and 'smart kitchen appliances') in order to cover a range of categories. Those appliances were presented as 'discourse triggers' and representatives of technology to facilitate an understanding of how elements have evolved and co-evolved, which could offer predictions for future product concepts. In the warm-up phase of the group session, the author wanted to know the images and meanings of domestic practices. Images or meanings are socially shared understandings, associated with the practices that give meaning to them (Pink, 2005, 2012; Shove et al., 2012; Warde, 2005). Meanings bring the concepts of norms, values, and

ideologies to the forefront (Shove & Pantzar, 2005) as indicated in the following statement from the focus groups. For some older women (FP7, FP5), housework and gardening were central in their life as a therapeutic exercise:

*FP7: "Every time I don't feel well, I go out into the garden and work. Then I just think about my plants".*

*FP1: "Yes, I also think that it is very relaxing."*

*FP6: "Yes, as long you can do it, physically".*

*FP7: "Whatever there is in front of me. Afterwards I feel better."*

*FP6: "Well, we both have hip damage, which really restricts you. 'I just say window cleaning,' ..."*

*(FG2)*

*"Well, I modified my garden a short time ago, and afterwards I said to myself: Even if I only had one week to live to look outside the window, and to see how beautiful my garden is, then I wouldn't care. At least I had one week to enjoy it (laughs)." (FP5, FG1)*

The focus groups confirmed the findings from the home interviews that older people want to stay in their homes as long as possible. In a Foucauldian interpretation the statement *"I try to repair everything on my own"* and *"not to be a burden"* (FP3, FG3) imply elements of self-care (Foucault, 1988; Grebe, 2013).

*FP7: "Everywhere. Yes, independence. To be independent. But also autonomy. I try to repair everything on my own before I ask somebody."*

*FP3: "Not to be a burden."*

*Moderator: "Not to be a burden, Mrs.? Repair it yourself?"*

*FP7: "Yes, if possible."*

*FP5: "I don't do that at all."*

*FP7: "I can do some things, yes."*

*(FG3)*

Doing the laundry has a symbolic meaning for the participants of focus group two because the washing machine signifies independent living:

*FP6: "And above all, it could happen that you have to go to an old people's home. Then you do not need a washing machine anymore. When you are old."*

*FP4: "Yes, you don't have to be old today, it can also happen to you in younger years, that you have to go to a home."*

*FP7: "Well, if you think like that then you needn't buy anything"*

*anymore. If you think like that...”*  
(FG2)

The author wanted to know how doing the laundry had developed over the decades and wanted to explore future scenarios because it is crucial that managers and designers define and develop features potential consumer segments consider to be relevant and acceptable (Mihailidis, Cockburn, Longley, & Boger, 2008). However, the situation of the older adults is usually not taken into account when it comes to innovation management. This view was held by all of the participants and was fiercely criticized by participant two in the second focus group:

*“Yes, but is the industry not that far that it thinks about senior citizens, like we are? We still have got some money in our hands. And we only spend it on devices we can deal with.” (FP2, FG2)*

This statement confirmed that “older persons do not get the technology they want” (Peine et al., 2015, p. 2) because companies neglect their demands. However, products that are designed with the ‘mainstream’ consumer in mind do not fit the current life-styles of older adults: *“The expectation of the industry is like that: they assume that everybody can do it or should do it and that is a generation problem.”*(FP4, FG2) While the starting point in the creation of a business model is the value proposition (Osterwalder & Pigneur, 2011), it obtains the main attention in focus group discussions.

### **‘Wall mounted washing machine’**

Physical ageing typically leads to mobility constraints (Higgins & Glasgow, 2012; Wahl et al., 2012) which is discussed in the literature (Chen & Chan, 2011) as a main usage barrier (Ram & Sheth, 1989) to accomplish domestic tasks. A possible strategy to overcome usage barriers is to integrate the innovation into the activity (Ram & Sheth, 1989). A persona, in her late 70s, was presented who is living alone in an apartment on the 7<sup>th</sup> floor of a high-rise building and has physical difficulties in moving down to the cellar to do the laundry. This user case described an autonomy-enhancing (Herstatt et al., 2011) solution in form of a ‘wall mounted mini washing machine,’ which can be mounted on the wall in the living room. The product would allow washing clothes without the need to go down the cellar. As it has to be installed at a wall in the living room it could help to overcome mobility constraints and offers

ergonomic benefits such as loading the machine without bending down. However, as a trade-off, it allows only 2-3 kg of laundry to be washed due to its size. In contrast to findings from the home interviews, where the participants demanded a solution to wash small amounts, this trade-off was regarded by all participants as unacceptable usage barrier:

*FP4: "But I need to wash more often."  
FP2: "Only three kilos? But how do you get the water inside?"  
(FG1)*

Strong concerns were raised by all participants regarding the installation work in the living environment, the practicality of only washing small loads, and product security (risk barrier):

*FP4: "Is that a real one? Well, first I have to have a connection and a discharge pipe for the washing machine... "  
Moderator: "Like for a dishwasher."  
FP7: "Everything must be rearranged, if you get such a machine."  
FP3: "... then we don't need a washing machine."  
(FG1)*

"Everything must be rearranged," this comment revealed the difficulty of challenging the habitus (Bourdieu, 1990), because "then we don't need a washing machine." This view confirmed Gomez's (2015) point of view, who suggested a rethinking of autonomy enabling products that require rearrangements. He recommended a stronger orientation in the design process to the existing living arrangements or the context of use, which is a rather neglected area in disruptive innovation research. Finally, it was remarked by participants that this product solution does not consider complementary activities such as the drying process.

### **'Washer dryer combination'**

When it comes to saving money, the contextual interviews showed that the dryer is usually not used, which was confirmed in the focus groups. In another very typical case of non-consumption, dryers were usually rejected.

*FP3: "We don't have a dryer."  
FP6: "We don't either. I don't want to have one."  
FP4: "No, we don't have a dryer, I dry my laundry outside, always, also in the wintertime."*

A possible strategy to lower the usage barrier of a dryer is “to integrate it with other home appliances that were considered essential ...” (Ram & Sheth, 1989, p.9). In the third focus group, a case scenario illustrating the use of a washer dryer combination was presented that offered possibility to wash and dry non-stop. This case was presented as autonomy-enhancing (Herstatt et al., 2011), because it would prevent the task of unloading the laundry from the washer to a dryer or would eliminate the need to dry the laundry outside in the garden. The feedback regarding the perceived ease of use was very positive across all participants:

*“Yes, I think at our age it is a huge saving, especially a saving in physical exertion.”*  
(FP4, FG3; general agreement of the whole group)

While discussing the washer dryer combination, controversial debates arose in all focus groups about the right amount of washing programmes, special functions and the level of quality required.

*“If the technology is too sophisticated, it is also prone to error. And if you think of all the repairs, they can get really expensive.”*  
(FP4, FG3)

The tendency in product management to “creeping featurism” (Norman, 2011; Chipchase & Steinhardt, 2013), which can be described as the habit of adding more and more functions and features to a product, suggests that product developers, marketing experts, and designers “who make and lay out material arrangements have a special hand in configuring practices and their relations” (Schatzki et al., 2009, p. 46).

*“But I also think, mostly washing machines have, I don’t know, 15 programmes and how many do you use? Three.”* (FP3, FG2)

The primary data, which was unexpected, showed that older people make rather rational calculations about their individual perceived ‘time left’ and the perceived product life time.

*“... and it doesn’t have to be too expensive, I am 79 years old. I don’t know how (remark: strong hesitation), I just talk about myself, you don’t know how long you live...”*  
(IP4, FG1)

*“Yes, I have a question. Washing machines seem to last quite long. Some have the reputation to last about 25, 30 years, maybe. Now you are 79 years old and you spend about 1000 Euros for such a high-performance product. Is it still worth spending 1000 Euros? Is it really worth it? According to my life expectancy? Do I need the machine, thinking like a ‘Lipper’ (remark: local expression about stingy people)? Many are going to say that there might be something cheaper, who knows if I still can experience it. I haven’t spent so much money then, have I?”*

*(FP8, FG2)*

The primary data from the focus groups confirm the findings from the home interviews, that an excessively low price would have unintended negative consequences. It would lead to technology rejection because the quality would be perceived as inferior. Participants rejected a too low price for a machine, which was also related to moral values. One participant (FP3, FG2) termed it *“Unterpreis-Maschine”* (*“undervalue machine”*) describing her unwillingness to accept this offer.

*“These low-priced products, they only exist because of the trade with China and the Far East. There weren’t such differences in former times.”*

*(FP3, FG2)*

*“I don’t mind paying a bit more. I have experienced this in my life, that in most cases the more expensive devices have been better. Not always, but in the most cases.”*

*(FP7, FG2)*

These quotes question that older people belong to the low end of a market which was defined by scholars (Anthony et al., 2008; Christensen & Raynor, 2003; Schmidt & Druehl, 2008) to consist of those customers with the lowest willingness to pay for the product. However, their high quality expectancy gets in conflict with their socio-economic situation in later life. This ambivalence was expressed by a retired expert:

*“In our current, older generation quality plays a big role. Just because you are used to things that last longer and aren’t made to be thrown away. The other thing might be the attitude towards the environment and how you treat your resources. Someday it is going to be a problem with the price, but I am part of the first generation where the pension isn’t that high anymore, because of the pension deduction.”*

*(EP 6)*

Based on the primary data, it is advisable to consider the work of Schmidt and Druehl (2008), which presented the conclusion that price is not a necessary condition for market disruption to occur. To the authors, there are exceptions to the rule that disruptive innovations are low priced: “low end encroachment is possible when the new product starts out as being high priced” (p. 359). Due to the findings and the rather high quality orientation of older adults, it is required to redefine the “price value” (Venkatesh et al., 2012) construct and to position disruptive innovations not as low-end in the sense of low quality. As in the home interviews, a common concern expressed by all participants was the water and energy efficiency of household appliances. One participant (FP5, FG3) reported that she wrote down the energy consumption of every single day and had been doing so for three years.

*“I write down how much electricity I use. Every morning I count it.  
Control – my counter.” (FP5, FG3)*

To another participant, (FP4, FG2) water was “*liquid gold*.” Here the influence of the experiences from the formative period, a time of scarcity and turmoil, comes to the foreground.

*FP4: “I pay attention to the use, the use of water and electricity.”  
FP1: “Water consumption is too expensive.”  
FP3 “It costs money. Water is expensive, electricity is expensive.”  
FP5: “Electricity is more expensive.”  
FP4: “Water is liquid gold.”  
(FG 2)*

To sum up, how to save energy was a predominant theme and was discussed enthusiastically in the focus groups. The concept of improvements that would enable washing and drying small loads non-stop without wasting energy, while still having the option to wash large items, was welcomed by all of the participants.

### **‘Automatic detergent dispensing programme’**

The home interviews confirmed the literature findings from various disciplines (Coleman & Myerson, 2001; Higgins & Glasgow, 2012; Rogers & Fisk, 2010; Wahl et al., 2012) that decreasing sensory abilities complicate the use of products, e.g., opening bottles, reading displays; lower cognitive capabilities inhibit the fast consumption and processing of data, e.g., comprehension of

speech or using interfaces (Fisk et al., 2009). These symptoms represent changing conditions in older adults' life that might give birth to new product requirements which were described in a persona. In the focus group, a scenario was presented of a washing machine with an 'automatic detergent dispensing programme,' making manual dispensing obsolete. The task of detergent dispensing was 'delegated' (Feldmann & Orlikowski, 2011; Latour, 1997; Shove et al., 2007) to the washing machine, which reduces manual dispensing and avoids overdosing of detergent. Here user independence was related to the product usage without external help. When participants were asked about the perceived usefulness of such a technology, they commonly appreciated the enhanced level of user convenience. However, strong concerns were articulated about the amount of waste of packaging of the detergent cartridges and the dependency on the detergent company. The appliance was perceived as a closed system with no other detergent supplier, which could affect the price in the long run.

*FP2: "Well, you have to, they dictate you the price and you have to take it. And I don't like that."*

*FP6: "But there is lot's of waste, too."  
(FG3)*

As such, progressive marketing managers need to be wary offering 'well-intended' automatic functions, which are meant to enhance convenience but are perceived as closed product systems by older adults. When it comes to independent product usage, many scholars (Chipchase & Steinhardt, 2013; Norman, 2013) refer to ease of use and simplicity as a key demand from users. However, it goes beyond this. As an example, one participant mentioned "*I am lost*" and referred to the specific skills required to operate household appliances.

*"I am quite open-minded concerning technologies, but sometimes it is not understandable for me. I learned English when I was a child. I had five years of English. That is not much. There isn't much left, and if the description of such a device is totally written in English, I am lost."*

*(FP2, FG2)*

Also other design elements can impede the acceptance of such a technology. For the participants of this study, readability is important as well as a good

instruction manual written in the German language, which is illustrated by the following statement:

*“You can adjust the scale. It has to be a bit bigger for the older people and there are usually two buttons so that you see: This one is for this, this one is for that. That is nicely stated. Above all it has to be big. The letters have to be bigger. Visible.”*  
(FP1, FG2)

To sum up, the statements underscored a key dilemma in product development. As this case has shown, a fully automatic programme that is designed to enhance usability and takes complete control over performance seems to be undesirable because “they confront other people with facts to which these others must accommodate themselves” (Schatzki, 2009, p. 46).

### **‘Smart fridge’**

In the home interviews, the participants described with enjoyment where they do their grocery shopping, and which products they prefer to buy and why. The ethical and moral themes that were raised typically related to aspects of freshness, health, and quality of locally grown vegetables. The case ‘smart fridge’ described an alternative way of doing the shopping. The concept of an intelligent fridge was presented as autonomy enhancing for a (fictive) person unable to move to the market alone. Further, the product recognizes contents and is also able to place orders automatically to replenish stock. As such, “the smart fridge is useful for older people as they experience a decrease in memory capacity” (Alolayan, 2014, p. 189). The ‘smart fridge’ also provides information about the food products, consumption history, and nutrition facts (Alolayan, 2014). From a social practice-based perspective, the example of the ‘smart fridge’ can be seen as problematizing the links between images, skills, and objects. The main concerns mentioned are the perceived functional complexity, the impacts of product failure, and increasing technology dependence, which appeared to be significant.

*FP2: “You are not allowed to press the wrong buttons, there could be something wrong coming out.”*

*FP1: “Yes, it is too complicated. Well, my husband has a smartphone, too, where he has got all his appointments. That is okay. But food? No, I can’t imagine such a thing. No. NO. That is too complicated. But, what I learned with 50 years, it doesn’t count today*

*anymore. If I had to learn this now, I could not do that anymore.”*  
(FG2)

This product case is an example that the traditional view of consumer empowerment (Shankar et al., 2006), shifting choice, and free will from producers to consumers require special consideration in product development. Concerning the discussion about autonomy enabling technologies this case showed a different picture of how older users are constrained and limited in the way in which they can use ‘smart’ technology.

### **‘Smart kitchen’**

One scenario was addressed to the area of ‘smart kitchen.’ It was described as an autonomy enhancing solution (Herstatt et al., 2011) by offering a connectivity of cooking appliances as directed from a central personal computer or from a smartphone if the individual leaves the house. Unsurprisingly, the perceived functional complexity was overwhelming and acceptance by participants was very low. However, the reactions were far from passive indifference. The participants expressed strong concerns about using connected smart kitchen appliances and used negative metaphors (“*all that fiddly stuff*”) to underline their discontent with technological progress. Like in the home interviews, they blamed themselves or the wrong “culprit” (Norman, 2013, p. 62), as not being able “*to cope with that*”

*“With all that fiddly stuff there... Well I don’t have any knowledge about technology. It is impossible for me. I could never cope with that.”*  
(FP2, FG1)

“*Not, for me. I am a creature of habit,*” mentioned one 80-year-old woman. The other older ladies strongly supported her by using metaphors like “*this is tingel-tangel*” or “*fummel-kram*” which are German expressions for perceived uselessness. These responses were rather expected from the literature review and expert interviews because their use innovativeness was rather low. As the technologies change faster than practices do, the unfamiliar additional functional complexity causes fear of making mistakes. The other participants also stated rather low technical self-efficacy when it came to ‘smart home’ applications:

*FP4: "That is really terrible. You don't need to think anymore, just tap on the screen and that's it. I think it is terrible."*

*FP7: "You have to think, you have to operate it."*

*FP4: "You have to have a clear mind. Yes, you can't switch anything out like you want, you cannot do that."*

With regard to smart home appliances, the participants also raised concerns of losing control; they preferred to trust their own senses:

*"I think with a normal common sense, you wouldn't realize that anymore and then you would just rely on the technical inputs, that would be too insecure for me. I want to realize everything as long as I have my eyes and my ears..." (FP4, FG2)*

Usually the connectivity of home appliances could also be used for security reasons. The responses from the participants were very emotional, they feared losing their independence: *"If they saw everything I did, they would be on the doormat every second day. (laughs)" (FP2, FG1)* One participant (FP4) expressed her general concerns when it comes to home monitoring technologies; she feared being spied upon. Here it can be seen how monitoring technologies lead to unintended consequences. A technology aimed at offering support for ageing-in-place could jeopardize well-being and a sense of independence because they feel controlled and watched (van Hoof et al., 2011). In an expert interview (EP4), a doctor confirmed the usefulness of that technology from his professional point of view, but expressed the low level of acceptance from his patients:

*"I know of 2 or 3 patients of mine, where I would be glad if they had such a thing... I think that the most important thing is that the people using it still have the possibility to intervene. To deal with it, means that they can still hold it in their own hands. ... it is not imposed on them. If they can't interact with it they lose their independence. For me this is a very important point." (EP4)*

Independent living possesses a duality: it is not only related to other persons, but also means being free from the constraints of technology. Again, psychological aspects emerged as he further remarked:

*"It is more about paternalism; it is less about the misuse of data, but more paternalism, more about this 'I don't want this'." (EP4)*

Further, the “price value” emerged as an additional major concern with regard to accepting the ‘smart kitchen’ concept. As an example, a 73-year-old man would spend the money for higher priorities in life:

*“I don’t think that I would buy a new kitchen at my age of 73. If something is broken, it has to be replaced of course. I want to cook and if I had a lot of money I would travel around the world. But who has so much money. (Laughing) (FP1, FG3)”*

Obviously, there are a number of problems that arise that are unique to the smart home setting itself (Edwards & Grinter, 2001; Ehrenhard et al., 2014). To conclude, the home interviews identified and the focus groups clearly validated existing houses were not designed to be smart. The realities of the home setting of the visited participants, coupled with the fact that adoption of home technologies is an economic factor, gives rise to a couple of challenges. It can be confirmed from the primary data that there are a host of technical, implementation, and systems design issues that were viewed as barriers by scholars (Edwards and Grinter; 2001; Ehrenhard et al., 2014).

*“Without technical knowledge, without someone who installs it, who cares for it and who repairs it immediately if it is broken and tells me what is wrong. You can’t do it without that. Someone who is older can’t deal with it. The technical knowledge is still not available.”*  
(EP5)

### **Smart appliances to support ageing-in-place**

Recapping the scenarios, when it comes to ageing-in-place the human body is important in many aspects, both as carrier and performer of practices. However, the centrality of “things and their use” (Reckwitz, 2002, p. 249) is endangered when the human body is not capable anymore to accomplish the job performance as described by two participants:

*“I have got a handicap because of my hand. I don’t know if you have seen it. And there is one thing I can’t do, I can’t cut or peel potatoes, it doesn’t work. I do everything else with my hand, everything. But this thing – it doesn’t work.”*  
(FP3, FG2)

*“Well the cellar stairs are something we still can climb, can’t we? But the stairs could be a problem, couldn’t they? Sooner or later.”*

*(Agreement)*  
*(FP5, FG3)*

The statements above confirm that people and practices are related, because practices reside in people's bodies and minds and are maintained and transformed when performed by people. The benefits of 'smart appliances' with all their special purpose features seem to be less interesting when the human body does not even allow mundane domestic activities like peeling potatoes or opening a box of butter. One older participant explicitly remarked:

*"There are some things to open. You see older people, they can't open things with their hands. It doesn't matter if it is butter, or margarine or something else." (FP1, FG2)*

The presented technologies are typical cases of 'technology push' initiatives, which the older people perceive as 'imposed' in their daily lives. The primary data emphasizes that further improved products with even more functionalities, reach their limits and cannot serve as the only route to support independent living. Several studies have shown that new technologies are mostly used to support existing practices (Jakobs et al., 2008; Loe, 2015; Norman & Verganti, 2012; Suopajarvi, 2014). The focus group sessions support those findings. The presented unfamiliar technologies and especially learning how to use them raised powerful emotions among participants. When it comes to future concepts of smart technologies, they are usually associated as useless with metaphors and expressions like *"it's too complicated,"* (FP1, FG2) *"knickknacks,"* (FP4, FG1) *"monster sci-fi,"* (FP4, FG2), *"it is very strange to me, this thing,"* (FP2, FG1) *"until I have understood that I am no longer here,"* (FP2, FG1) and *"you need to have a clear mind"* (FP4, FG1). Some fear to do something wrong *"you just have to do something wrong and then..."* (FP7, FG1). In general, most want to stay with the familiar (FP4, FG1):

*"I can cope much better with the things I already have and with the procedures I have done so far. To connect all the appliances would be too complicated for me and if something doesn't work everything is gone." (FP4, FG1)*

As a consequence, if no perceived usefulness is recognized by participants, then any further attempt aimed at further increasing smart appliances for older adults seems to be ineffectual. As a matter of fact, it appears that the functional

complexity of all presented smart home appliances is overwhelming. Thus, managers should be aware that age-related declines in cognitive or physical abilities might affect an older adult's adoption of unfamiliar technologies. Basically, their potential target customers prefer to stay with familiar product concept which at the same time incorporates the latest washing technology to save energy and money. This can be addressed by designing appliances using existing "mental models" (Higgins & Glasgow, 2012, p. 335) and transferring learned usage patterns from old to new technologies. As a consequence, "a silver product innovation which is based on an existing product platform has great potential to retain customer loyalty" (Herstatt et al., 2011, p. 10).

The focus group outcome clearly confirmed previous empirical studies that innovations should be compatible with current routines and habits (Bagozzi, 2007; Ram & Sheth, 1989). Most importantly as a guideline for product management, that higher acceptance for smart appliances can be achieved with a product strategy that adapts an "existing product platform" (Herstatt et al., 2011, p. 1) and pays attention to already-in-place-arrangements (Gomez, 2015).

### **4.2.5 Findings and implications of research stage 2**

None of the participants in the focus groups had any prior experience with 'smart fridges,' 'smart kitchens,' or any other smart appliances. Numerous concerns were raised that make the implementation of smart appliances more difficult. The first is connected to the perceived direct use of the product, which in many cases is not perceived as easy or self-explanatory and would require help. Thus, those products cannot be defined as autonomy enhancing (Herstatt et al., 2011) because they cannot be used independently. The second concern relates to being scripted or constrained by technology and learning how to operate the product. In all the presented cases the potential older users were annoyed to give up control to technology. Therefore, these products seem to be rather counterproductive to autonomy enhancement.

#### **'Familiar' product character**

Technological changes notwithstanding, the habits of older adults are resilient, which is an important insight for innovation management. The idea of relocating

the washing machine, which in some cases has been in the same place for fifty years, or acquiring a washing machine that can be installed on a wall in the kitchen or bath requires too much. But there is the other side of social disruption. The older people expressed how their life had changed after retirement or after their children moved out. They discussed how those changes affected domestic practices (*“small wash loads”*). To Trentmann (2009), “most disruptions in social life are not deliberate ... but they disturb habitual ways of doing things” (p. 81). It is not only technology that can be disruptive; the social situation can also be disrupted. As the research showed, disruptions in later life lead to a change modus in people’s life which might affect attitudes towards technology in a positive way. Thus, disruption is also recursive between independent living and technology:

*“They accused me of being cheeky. But I told them that it wasn’t true, I had to take care of myself. I got more independent. (agreement)  
More independent, right. That was the impudence. (laughing)”  
(FP1, FG3)*

As the example showed, for many older persons, ageing disrupts known and familiar situations and practices. In an expert interview, a doctor (EP4) mentioned: *“to keep things to some degree the same, you must change and begin it now.”* However, one expert (EP7) underlined the difficulties to anticipate unwelcome change (Trentmann, 2009) and that most older people are not willing to prepare themselves in advance:

*“Why should I do that? Why should I deal with such a topic? I just do it if it is really necessary. I think this is how it works. To deal with essential topics in a preventive, prophylactic and early way, human beings don’t do that easily. It is hard as a care provider to make up your mind about the question: What can we offer to human beings if the demand isn’t there?” (EP7)*

When it comes to considering innovations and technologies for ageing-in-place, it requires the ability of designers and managers to anticipate an unwelcome change in the life of a person. It appears that a disruption in social life leads to a change in practices which affects the social order (Hargreaves, 2011). To a large extent, it is obviously the level of ‘smartness’ of the appliance to stabilize the social order (Edwards & Grinter, 2001). To create products with the aim to *“keep things to some degree the same”* (EP 4) requires highly flexible,

adaptable product concepts that strengthen the linkages of the elements of a practice. In this line of thought, many current smart appliances need to be questioned. Managers should be aware that their potential target customers have a strong attachment to existing living arrangements. They are not willing to integrate new domestic appliances in their daily practices that require a major installation effort or a new arrangement in their homes. This perception requires a configuration of autonomy enabling innovations (Gomez, 2015) that meet current living arrangements. Further, it is important to be aware of the disruptive changes in later life that lead to different usage patterns and to address them with more adaptable and flexible product concepts. This is confirmed in an influential study by Rogers and Fisk (2010) who mentioned that technologies of the near future will be “adaptive to individuals changing needs, capabilities and preferences” (p. 5). Changing those designs to suit the older people requires an acknowledgement of existing mental models (Higgins & Glasgow, 2012) and would lead to a product strategy that adapts a product from a familiar “existing product platform” (Herstatt et al., 2011, p. 1). It relates to the notion of “signifier” that is defined by Norman (2013) as “any perceivable indicator that communicates appropriate behaviour to a person” (p. 14). This “signifier” can incorporate marks or sounds and includes e.g., user interface, programme specification, programme description or the orange button on a 20-year-old washing machine which signifies: ‘open the door’ (see figure below).



**Figure 35: Product demonstration during research (“signifier” directs appropriate use)**

The focus group findings invoked the overlapping commonalities of the gerontechnological perspective of “individual lag” (Peine & Neven, 2011, p. 130) and “sustaining innovations” (Christensen & Raynor, 2003, p. 51). Individual lag

indicates that a person's capacity lags behind technological developments (Peine & Neven, 2011). Additionally, from the perspective of Christensen and Raynor (2003), sustaining innovations 'overshoot' the ability of some customers to absorb performance improvements. As a consequence, the perspective from both the literature and research findings favour disruptive innovations as a more appropriate concept for older adults or as Anthony et al. (2008) briefly put it "good enough can be great" (p. 8). A possible new class of technologies that could support practices in a non-disruptive, seamlessly manner is termed zero-effort-technologies (Mihailidis, Boger, Hoey, & Jinacaro, 2011). These "operate with minimal or no explicit feedback from the user, which translates into minimal or no learning or behaviour modification requirements of the user" (p. 3). Those zero-effort-technologies (ZET) could be disruptive from a commercial point of view, offering fewer features at a lower price, but are non-disruptive from a users' perspective. Most importantly, the participants expressed concerns of being restricted in their flexibility and freedom. They were annoyed when appliances remove control and flexibility which can lead to unintended consequences by not letting people operate the machine independently anymore. Well intended features created by product managers and designers that make products more 'simple and easy-to use,' might take competences away that were acquired over the life time of an individual. This contradicts with the liberal view of consumer empowerment and autonomy enhancement. It also questions the capability approach (Coeckelbergh, 2012; Nussbaum, 2003, 2011; Oosterlaken & van den Hoven, 2012; Sen, 1999) which acknowledges that people should have freedom to decide for themselves (Steen, 2013). The observations indicate that the acceptance of fully automatic programmes that delegate competences from the user to the machine will be higher when the programme allows for redelegating the task to the user. Enhancing independence is not merely a matter of supporting physical needs. An older woman (P8), from the home interviews, vehemently emphasized her wish to control things ("*I really like to remain at the wheel*") and fiercely criticized the rising dependence on technical devices:

*"I have to say there should be the possibility for the next generation of washing machines to tell the machine: 'Now, you do it as I want and not as you want!'" (bangs on something with a metallic sound)*  
(P8)

For her, to be dominated by technology is an agonizing form power takes (Shankar et al., 2006). In an interview with an expert participant (EP9), the author raised the question of whether, and to what extent, the routines of older adults could be changed. The 79-year-old respondent suggested that giving computer courses to the elderly seemed to be the best example of empowerment in later life and responded: *“Slowly, yes. You can get them make used to it.”* (EP9) He reported about his experience in giving computer courses to older adults that required other ways of training, respecting that older adults have a chance *“to get used to”* the new technology:

*“If you try to teach the older generation to work on the computer, you have to go special, more practical ways. I have given computer courses to get the older people used to it.”* (EP9)

In an expert interview, one expert participant (EP6) related the technology acceptance to communication and stated:

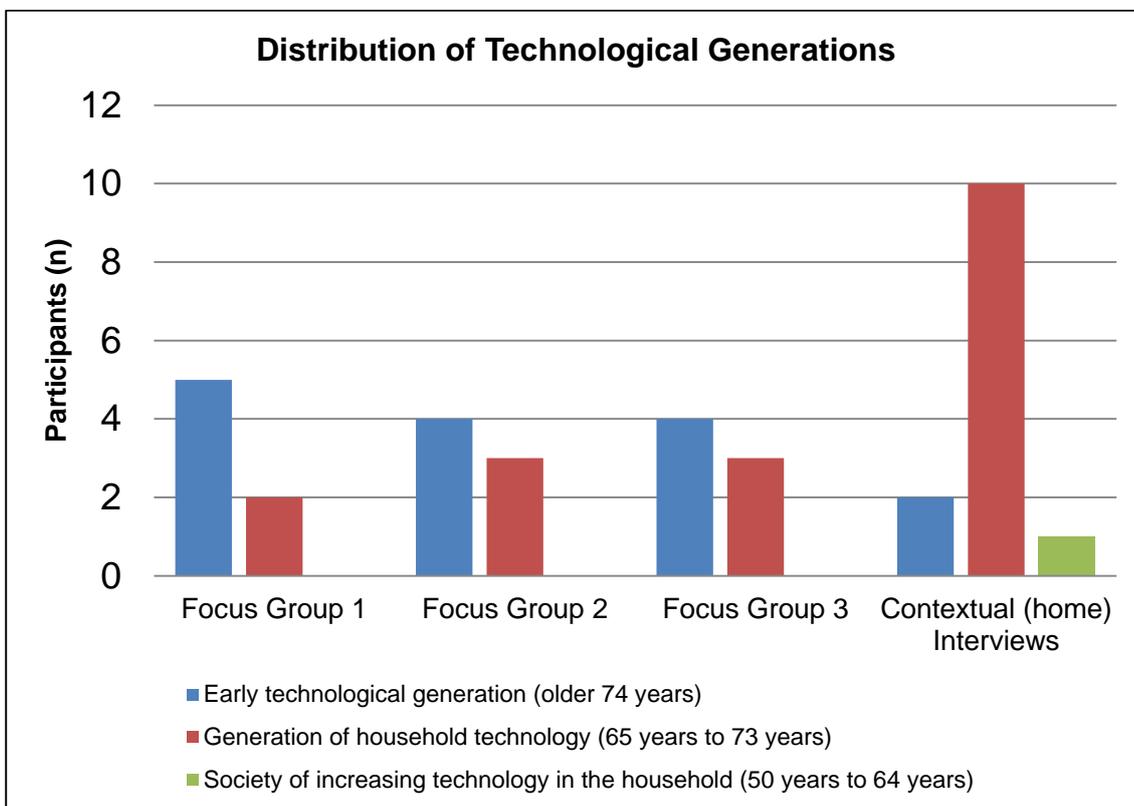
*“You can’t just put things in front of the elderly, you have to explain it to them and then, I think, they accept it”.* (EP6)

For future product developments a couple of conceptual directions can be recommended. First, the technological dimension needs to relate more strongly to the different user typologies. The author regards technologies as ‘smart’ that respect and adapt to social life disruptions and do not script or force users in an overly excessive way. Further, it requires a design approach that builds on past user experiences and adapts from a well-known, learned user interface to future interface concepts. Second, the existing coherence of products in the homes, the emotional bonds, is a significant barrier as they define place. The capabilities and willingness of a 75-year-old single woman to reorder her safe structure of existing arrangements (Gomez, 2015), which requires to install new technologies is far from realistic. Thus, the household social context, particularly the ‘path dependency’ and the existing socio-technical arrangements, needs to be considered. Third, in the comments stated above, it becomes apparent that technology use is influenced by the habits, routines, conventions and power relations between producers and users. Older adults will only accept new technologies when the implications and consequences are explained. As a consequence, external communication is a key enabling dimension. To reduce fear and anxiety it is crucial to build up trust in new technologies. External

communication requires the ability of designers and managers to respect different cognitive and physical capabilities in order to build a supportive context for new technologies and to establish creative, ‘low-threshold’ learning approaches. Obviously, ‘peer-to-peer’ explanations should be included when it comes to the integration of technologies in the practice-as-entity.

**Influence of the formative period**

The study included older people, who were all (except one) retired, but whose biological age difference was almost 25 years. They all had different personal histories, social backgrounds and very different inclinations to use technology. Only a few had a computer and a mobile phone, no one was using social media like Facebook, mainly for privacy concerns.



**Figure 36: Sampling structure of older adults in current research**

The research participants (some were over 80 years old) vividly reported and recalled the amazement that they felt about their first washing machines, purchased over fifty years ago, which made life so much easier. Most focus groups participants of the ‘early technological generation’ established their homes near the end of the 1950s, some even earlier. Apart from personal hardship and scarcity in social life, they experienced a development in the

practice of doing the laundry with changes in the elements (skills, objects, images) and in making and breaking linkages resulting in a very different 'job to be done.' In retrospect, for some, doing the laundry during their formative period had the image of being a "*struggle*" and "*torture*."

*FP4: "Yes, the white laundry was put on the bleach. And then it was wetted with a watering can."*

*Moderator: "Outside, what does it mean, on the bleach? What is that?"*

*FP4: "It was laid onto the grass."*

*Moderator: "Onto the grass and then it was bleached by the sun. Weren't there any stains because of the grass?"*

*All: "No."*

*FP3: "But it was really a torture – doing the laundry. My God."  
(FG3)*

However, to change habits and images of a practice in later life seems to be more difficult. A comparison between participants of home interviews and focus groups confirmed the literature that different technology generations behave differently with respect to technology. This can partly be explained by differences in technology experience during the formative years (Loe, 2015; Sackmann & Weymann, 1994; van de Goor & Becker, 2000). As the narratives about doing the laundry in former times suggest, the focus group participants from the 'early technological generation' did not have the opportunity to become skilled in using 'electro-mechanical' household technology (Sackmann & Weymann, 1994; van de Goor & Becker, 2000). This was different for most participants in the home interviews. In their formative period, household appliances started to become mass-market products. Clearly, participants from the 'early technological generation' in the focus groups showed more difficulties in perceiving the benefits and were unlikely to adopt or integrate them. Whether this negative attitude can be changed depends very much on whether the existing objections can be overcome. The findings underlined that fear and anxiety are major hurdles that have to be addressed when it comes to the acceptance of new smart technologies. Against this background, it becomes clear how the formative period influences technology perceptions of today. The author suggests that in innovation management it is important to understand the historic development of a practice in order to identify patterns (Kurz, 2006; Shove et al., 2012). Particularly, it needs to be considered how ties of related

elements were made and broken and how elements of a practice evolved and coevolved over time (Kurz, 2006; Shove et al., 2012). However, technology was not the key strategy for older adults. In the second focus group, the elderly confirmed their wish to stay independent but underscored that they do not want to be alone, isolated, or to live in a solitary manner.

*FP2: "Who wants to be alone."*

*FP6: "I think I would prefer to stay in my house."*

*FP3: "All alone?"*

*FP5: "Then you would be all alone."*

*FP3: "No, it is nicer to be amongst other people, even when you are old."*

*FP4: "It would be nice to have an intact neighbourhood where people provide little services in the neighbourhood. So, one could say: 'Well, we could do that for you...' YOU also have to talk the neighbours."*

*(FG2)*

Comments were made like *"it is nicer to be among other people, even if you are old"* and *"who wants to be alone?"*, which related to the possible negative impacts of technology enhancing autonomy, but leading to a reduction of social contacts (Sparrow & Sparrow, 2006). The statements above confirm that practices "make participants co-exist and come together" (Nicolini, 2013, p. 173). Those statements contrast the general view of scholars that quality of life is largely determined by the ability to maintain autonomy and independence (Gaßner & Conrad, 2010; Malanowski et al., 2008; Mollenkopf et al., 2010). Autonomy and living independently overemphasises the idea that older adults deliberately choose the form of living, the free will, and choice. An orientation to practices offers a complementary perspective, that of sociality, bringing (elderly) people together and of 'ageing together' (Botero, 2009). "Practices ... are by definition social phenomena, first because they keep participants together and second because their organization and accomplishment depend on working together of many people" (Nicolini, 2013, p. 168). This view speaks to systemic innovation (Murray et al., 2010), which requires a more progressive approach by policymakers and includes different infrastructures and regulations to offer platforms where these practices can be shared. The view that practices are social, joins the group of older adults through common practices. Practices cause people to come together and direct the attention to developing a "caring community" (Kruse, 2013b, p. 380) in form of neighbourhoods, where people

unite to form a caring and supportive environment or in form of an active community life with shared practices and 'ageing together' (Botero, 2009). These statements give support to community-ship and the sharing economy. The concepts of community and sharing are valued by many participants in the focus groups. As a key example to illustrate the point, for an 80-year-old woman, who lives alone on a property with 10.000 square meters, the awareness of her neighbours and relatives being supportive is a tremendous relief (FP4, FG1):

*"I have a very nice neighbour who takes care of my wood, I am very thankful for that. I have very nice neighbours who care for me. If they haven't seen me for some days, they call me and check if I am still alive. Moreover, I have my sister and my brother-in-law living next door, they are very helpful and they take the bags, because I have an eye illness and I am not allowed to drive a car and I can't see very well." (FP4, FG1)*

Sharing and caring seem to be important not only for practices among friends and neighbours, but also when it comes to product use. The idea of sharing was also discussed in the focus groups. Apart from discussions about smart technologies and household appliances, a discussion emerged about living alone and doing things together and sharing practices. The concept of sharing capabilities and practices surfaced during the discussion. The focus group participants began to not only challenge existing practices, but also to re-assemble images, skills and objects in new ways.

*FP1: "Some can fill their tanks, others can 'iPod'." (laughing)*  
*FP5: "Well, if somebody helped me fuelling my car tank, I would write something for him (laughing). Or I would buy something nice." (FG3)*

Sharing also relates to 'sharing places,' or living together. For one elderly woman (P6), who lives with her daughter and granddaughter, the awareness of her family being close represents tremendous support. She knows that she can rely on them in the event of an emergency or difficult situation: *"There is always someone there"* (P6). They are a close family and are even a bit proud that they care for each other. The cardinal point is the solidarity in the family. The statement *"we always help each other,"* (P6) which was also underlined in an expert interview (EP6), expresses the wish that someone could help explaining

technology to them. The value proposition of sharing seems to be highly relevant for all older adults. Basically, the discussions were centred on the sharing of human and physical resources. In recent years, concepts of sharing as business opportunities have gained increasing attention in management and academia (Belk, 2014; Botsmann & Rogers, 2010; The Economist, 2013). However, this approach challenges the traditional relationships between producers, retailers, and consumers; it also disrupts the traditional producer attempt of 'buy more' and 'buy new' (Botsman & Rogers, 2010; Johnson et al., 2008). This aspect will be addressed separately in a subsequent stage of the research.

### **4.3 A new disruptive innovation paradigm: 'Positively disruptive'**

The discussion and evaluation of the various cases was based on the skills, image, and object framework (Shove & Pantzar, 2005). The feedback of the participants confirmed the literature (Chipchase & Steinhardt, 2013; Christensen & Raynor, 2003; Norman, 2013), that new technologies are overloaded with superfluous, unnecessary features which most older customers are not willing to adopt (see also Appendix 15). The discussions about the different scenarios are in line with the statement of Norman (2013) who pointed out that everyday appliances are increasing in complexity. "Washing machines and driers, dishwashers, and microwave ovens, coffeemakers and refrigerators are all now available with complex menus, multiple choices and improvements" (Norman, 2013, p. 262). To overcome perceived usage barriers of older adults, concepts from sociology and innovation management have been considered. Some scholars (Reckwitz, 2002; Shove, 2009) from the field of social theory of practice might view a merger with social theories of behaviour as incommensurable. Nevertheless, the author sees a 'bridge building' functionality between disciplines by taking a 'practice lens,' which can be described as the orientation to the actual accomplishment of the doing. Although they are very different and partially contrasting concepts, disruptive innovation and practice theory share a holistic approach that the 'job to be done' (Christensen & Raynor, 2003) and the practice is a focal point of perspective, not the product.

The author has used this perspective as an analytical tool kit (Nicolini, 2013) to provide a richer and more nuanced understanding of the world of the older people.

The findings from the focus groups mostly validate and extend the results of other research about the concerns of integrating smart technologies (Demiris et al., 2004; Ehrenhard, 2014; Mollenkopf et al., 2010; Peine & Neven, 2011). A general attitude was held by the focus group participants that was characterized by statements such as “*experience cannot be replaced by technology*,” and that smart home technology is something for younger, “*busy professionals*” that do not have the time and the experience. However, the feedback to the scenarios suggests that older adults show more interest when the smart appliance suits their domestic structures where daily activities are embedded. All in all, the findings of the contextual interviews, expert interviews, and the focus groups correspond with each other; home is not just a physical place where domestic tasks are carried out. Venkatesh et al. (2003) configured the home in terms of “living space,” which includes the social, the physical, and the technological space (p. 23). “These three spaces are not mutually exclusive. And the meeting of these three define how families carry on their everyday life” (Venkatesh et al., 2003, p. 27). Furthermore, he pointed out that the technological dimension consists of the household technologies that are embedded in the physical space and are used by individuals as part of the social space (Venkatesh et al., 2003). For this purpose of study, the author conceptualized older adults’ home as a living space, where daily activities unfold and that includes three areas: the personal dimension, the household social context, which includes the physical space; and the technological dimension. The primary difference existing between the definition above and that of Venkatesh et al. (2003) is the emphasis of the personal dimension due to the important role of life course changes. To deconstruct the laundry route (Pink, 2009, 2012; Shove, 2003) and to view the laundry activities as related to the three spaces of personal dimension, household social context and technological dimension helps to identify disruptive innovations to facilitate the job-to-be-done (Christensen & Raynor, 2003). In the following, the author expands on Christensen and Raynor’s (2003) terminology and describes those innovations that are disruptive on the company level as ‘positively disruptive,’ when they simultaneously aim to facilitate ageing-in-place in a non-disruptive manner. Consequently, it is

important that before the product development process starts, the perspectives being considered are made clear from the outset to fully understand the impact.

To conclude, all dimensions (household social context, technological dimension, personal dimension, external dimension) are closely interrelated, not isolated, home spaces (Venkatesh et al., 2003). This view provides a starting point for identifying disruptive innovations that support “home as a living space” for older adults (p. 23). Figure 37 on the next page underscores that the job-to-be-done (Christensen & Raynor, 2003) or the ‘wash cycle’ (see Figure 20, p. 81) is interwoven with these interrelated dimensions (Venkatesh, 2003). As such, Figure 37 synthesizes both aspects, which can be used as an ‘innovation map’ to identify areas of innovations. To take that perspective allows for an open dialogue about making and strengthening links.

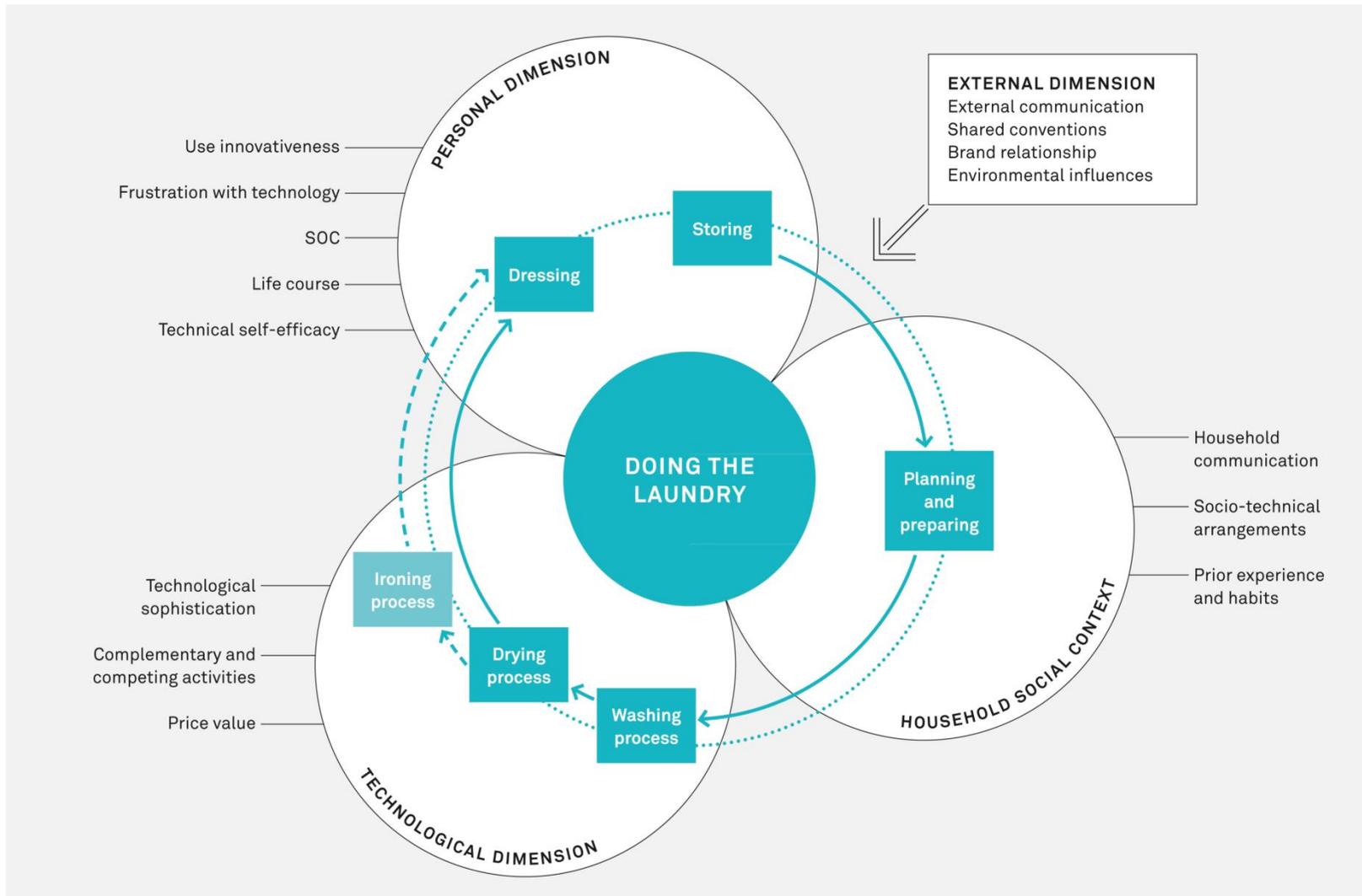


Figure 37: Understanding the job-to-be-done (based on Venkatesh et al., 2003)

The primary data shows that the paradox for the elderly and designers, and the main challenge, when it comes to innovation for ageing-in-place is to anticipate unwelcome change in the life course of a person. For many elderly ageing is disruptive to known and familiar situations and practices. Creating products with the aim to “*keep things to some degree the same*” (EP4) requires anticipating a disruption in the daily practices and strengthening the linkages of elements of a practice. Technological novelties could be disruptive from a commercial point of view because they offer fewer features at a lower price.

The following table illustrates the basic differences of the discussed models.

**Table 39: Comparison of research models (adapted from Shih & Venkatesh, 2004)**

Criteria Model	Variable of interest	Typology of population	Relevant criteria	Elements unique to each model	Elements common to all models
Use-Diffusion Model Shih & Venkatesh, 2004	Use	Intense users Specialized users Non-specialized users Limited users	Rate of use and variety of use	Product experience Competition for use Sophistication of technology Satisfaction	Technology-in-practice (Feldman & Orlikowski, 2011)
'Positively disruptive innovations' (conceptual model)	Domestic Practices (unit of analysis)	Limited users	Job to be done	Practice based lens (images, skills, objects)	
Diffusion of Innovation Rogers, 2003	Adoption	Innovators Early adopters Late majority Conservatives	Timing or rate of adoption	Observability Compatibility Triability	

## 4.4 Research stage 3: Exploring business implications

The final question (RQ3) relates to the business implications and evaluates how disruptive innovations targeted at the elderly segment should be commercialised:

**RQ3: What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?**

This question relates particularly to the intersection of innovation management, entrepreneurship, and demographic change (Kohlbacher et al., 2014). Christensen et al. (2008; 2009) applied disruptive innovations to address positive social change in matters of education and health care. Although “golden opportunities” are promised for entering the ageing consumer market (Kohlbacher et al., 2014, p. 73) by following technological innovation (Gaßner & Conrad, 2010; Mollenkopf et al., 2010; Thielke et al., 2011), results have been disappointing. The expert interviews and focus groups contributed to the view that an “overly instrumental view on technological innovation” (Peine et al., 2015, p. 2) is not sufficient to solve the “grand challenge” (Peine et al., 2015, p. 1). As an example, one 80-year-old woman mentioned her emotional attachment to the house, but also the challenge to get domestic work done due to the size of the house:

*“I am the fourth generation in this house. My great-grandfather bought it in his day, it is 10.000 square meters, that is quite nice and I am now alone there” (FP4, FG1).*

Against this background, a better understanding of business model implications is required as “many businesses now see social innovation as field for creating new business opportunities” (Murray et al., 2010, p. 178). During an expert workshop in June 2014, participants discussed the opportunities and challenges related to aspects of social innovation (Mulgan et al., 2007; Murray et al., 2010) and the “sharing economy” (Belk, 2014; Botsman & Rogers, 2010; Matzler et al., 2015) for companies operating in established value networks (Klenner et al., 2013). Those discussions focussed particularly on identifying ways to integrate and link these ‘alternative’ approaches to the innovation strategy and business

model of a company as an alternative business opportunity. That field of research seems rather underexplored in academia (Botero, 2009; Murray et al., 2010).

#### 4.4.1 Planning, conducting, and analysing a ‘creative workshop’

By using the snowball method, it was possible to recruit relevant interview partners from the private network of the author. Experts were approached with backgrounds in strategic management, business development, and participatory research methods like Design Thinking (Brown & Wyatt, 2010) in their past or current profession. The nature of the session was more a creative workshop to explore future concepts (‘what ought to be’), as opposed to the ethnographic attempts of the home interviews that focussed on the current situation (‘what is’). Due to this significant difference, the author termed this type of data collection ‘creative workshop.’ The following table provides an overview of participants, their backgrounds, and current activities. The focus group session lasted for approximately two hours. The data gained by focus groups are displayed as WPx for workshop participant, where the x is the number of the participant.

**Table 40: Focus group with experts (Berlin, June 11th, 2014)**

Participant	Current Profession	Background / expert knowledge
WP1	Managing Director	Strategic management (social innovation)
WP2	Retired; part-time student	Engineering management, ‘communication design’
WP3	Entrepreneur (freelancer)	Business development (start up company)
WP4	Business Manager (insurance company)	Corporate strategic management

### **Setting of workshop**

The workshop with experts (Meuser & Nagel, 2002) was conducted in a format that invited discussion about sharing concepts and was solution oriented (the topic guide is provided in Appendix 16). In this context, the sharing themes that arose from the home interviews and focus groups with the elderly were covered. The author, as the moderator, presented two fictive scenarios of possible alternative approaches related to domestic practices with the objective of discussing the 'value proposition' (Christensen et al., 2009; Osterwalder & Pigneur, 2011) and the business implications for an established company. Scenarios are a means to bring different disciplines and experts together, so that they can develop a shared understanding (Steen et al., 2014) and have been used in various participatory design studies (Compagna & Kohlbacher, 2015; Kuijer & De Jong, 2011; Renaud & van Biljon, 2008).

#### **4.4.2 Identifying business implications**

Prior to the presentation and discussion of alternative business concepts, the participants were asked to imagine how they would like to age. Responses like *"together,"* (WP1) *"with my family,"* (WP1, WP2) and to be *"part of the community"* (WP4) validated the findings from the prior research that 'sociability,' 'sharing,' and 'collaboration' are highly valued. The prior research suggested that older adults with 'limited use' have a different demand structure. That demand structure was characterized by a common view of less is more as shown by the following comments made by the elderly participants about technology: *"not for me anymore,"* (P3) *"I cannot live it up,"* (P3) *"that is something for people who sit in an office,"* (P12) *"for people who lack experience,"* (P13) *"for people who work"* and *"for this, our laundry is not dirty enough"* (P11). Those sentiments provided starting points to explore novel opportunities for companies within the sharing economy.

The boost of new concepts in the sharing economy (e.g., Airbnb, Netflix) is mainly enabled and facilitated by the growth of information technology, which allows more efficient peer-to-peer contact (Belk, 2014; Botsmann & Rogers, 2010; Matzler et al., 2015). Against this background, entrepreneurs of a traditional ownership-based business models should consider products and

services in the realm of collaborative consumption (Belk, 2014). As they are already applied in business models such as eBay and car sharing (Belk, 2014; Botsman & Rogers, 2010, Matzler et al., 2015), an extension to domestic practices and the segment of elderly consumers could be seen as a means to support social interaction and to overcome financial issues of buying a new, high quality appliance. Attempts such as those could be classified as 'positively disruptive' because they have the positive social implication of being autonomy-enhancing (Herstatt et al., 2011) and could also "render established technologies obsolete and therefore destroy the value of the investments that incumbents have made in those technologies" (Danneels, 2004, p. 248). Christensen (2013) suggested that disruptive innovations are those which render particularly established companies and products redundant and that reconfigure interpretations of product value. However, processes of decay also affect established organizations in the social sector. One expert (EP7), the managing director of a care organization, reflected on his own healthcare business and proposed an active community life with shared practices.

*"Retirement homes: they are a relic of another century, when such homes were needed. But today, people need to come together to help each other: We as a society have to develop together. We have to become a "We"! Nobody should go to a residential home, because we can care for each other. It should never happen anymore that a grandma suffers unnoticed in her apartment." (EP7)*

The following scenarios are used as 'pathfinders' (Steen et al., 2014) to explore this rather unfamiliar business field.

### **Scenario 1: Product service systems**

As introduced in the literature review, product service systems (PSS) provide the opportunity to explore strategic new market opportunities (Mont, 2001) and disrupt traditional industries based on models of individual private ownership (Botsman & Rogers, 2010). Based on earlier studies (Baines, Lightfoot, & Steve, 2007; Beuren et al., 2013) the presented scenario in this study described a product service system (a washing machine) which included a monthly payment plan and additional, personalized service offerings (installation, maintenance, etc.). That conceptual idea was derived from the primary data as most elderly showed high brand loyalty, but were unwilling to pay premium

prices for additional features. That sentiment was expressed very clearly in a statement made in the focus group:

*“Stop it! You spend 1000 Euros on a washing machine and on a small dryer? And you are 79 years old?”  
(FP2, FG1)*

The experts shared the view that ‘hiring the use’ of a washing machine can bridge the cognitive trade-off between costs and high quality products. As such, offering the innovation on a ‘trial’ basis without an outright ownership would help to lower the risk and value barrier (Ram & Sheth, 1989). However, the experts supported the findings from the literature that “consumers are unaccustomed to using products without owning them, and the providers are unaccustomed to offering a product while maintaining ownership while they offer support services” (Beuren et al., 2013, p.229). Thus, many unresolved issues remain for the supplier side in relation to product return and the prior involvement of relatives.

### **Christensen’s (1997) *Innovator’s Dilemma* reversed**

With regard to new business concepts (e.g., PSS) that are targeted at the ageing consumer segment, the experts confirmed the findings from focus groups and contextual interviews that brand relationship gives a competitive advantage for established companies. That evidence contradicts Christensen and Raynor (2003) who regarded newcomers as the key driver of disruptive innovations. However, in contrast to Christensen’s seminal work (1997), the *Innovator’s Dilemma* is on the newcomer side. The scenario described above would most likely fail if offered by a newcomer. The below statements also emphasize that established companies that want to target older adults need to acknowledge different kinds of norms which guide their customer relationship.

**Table 41: Participant feedback (scenario 1a)**

Participant Feedback Scenario 1a	<i>“The question is solely what can be offered for 20 Euros ....., and what happens after three years, when they don’t want to have this machine anymore, at best they want to keep it as long as possible, ....” (WP4)</i>
	<i>“What do I do as an entrepreneur if an older customer suddenly dies? These are possibly new things you don’t have experience with. How aggressive do I get if the older person doesn’t pay, do I get aggressive at all?” (WP4)</i>
	<i>“... it is just that this sandwich-generation immediately sticks at my heels. Then they are going to say, ‘Granny, what have you signed there?’ And you really shouldn’t underestimate what you will have to face then...” (WP2)</i>

It was stressed by the experts that the marketing activities need to be consistent with the relationship norms (Aggarwal, 2004), which include aspects of responsibility and empathy for the older customers. Obviously, this welfare-oriented “communal relationship” (Aggarwal, 2004, p. 89) is very distinctive from the traditional business customer relationship of ‘buy more’ and ‘buy now’. To sum up, in the discussed scenario it became prevalent that disruptive innovation is a business model problem dependent on many facets, not a technology related issue alone.

Customer resistance in the form of value barriers can be lowered by offering pre-owned appliances at a reduced price. The implications of buying a used washing machine were discussed, which some of the focus group participants found interesting

*“You can still ask the dealer, if there are second-hand machines that aren’t used that much. .... Also dealers sometimes have second-hand machines.”  
(FP5, FG2)*

This scenario is based on used or pre-owned goods being passed on from someone who does not want them to someone who wants them (Botsman & Rogers, 2010). In the discussion with the experts about the ‘sharing concept’ of ‘used appliances,’ the service aspect with the ability to return the used appliance was perceived as particularly important for older adults when life events (move to an aggregation centre) required it (WP2). A highly relevant aspect, that occurred in an earlier research phase (day care centre). However, the participants’ common view was that ‘used appliances’ typically did not represent a company’s core business, which relates to new forms of

organization and infrastructures. Scholars from gerontechnology (Peine & Neven, 2011) referred to “socio-structural lag” (p. 130) as the failure of the environment to provide resources to support the elderly, which leads to systemic innovation (Murray et al., 2010). In this area, ‘exchange platforms’ for used appliances could be considered. In addition, strong concerns were raised to offer used products because it would inherently symbolize stigmatization (‘old’ machines). However, during the second focus group, older adults did not reject the option to buy a used machine (FP5), which underscores that “the pictures in our mind, our mentalities ...” (Rentsch et al., 2013, p. 12) are outdated. To sum up, the attempt to offer ‘familiar product concepts’ to older adults in form of ‘used appliances’ was a rather controversial subject and might not be attractive enough for companies; here policymakers might support systemic innovations (Murray et al., 2010).

**Table 42: Participant feedback (scenario 1b)**

Participant Feedback Scenario 1b	<p><i>“...things are going well, especially in the public sector, where you have to have the newest devices, and the computers are just three, four years old, but still very usable... you could sell them to older people ... from an ecological point of view, this is absolutely reasonable, sustainable.” (WP1)</i></p>
	<p><i>“... arguments in favour of it are good, ..., I just have a problem to say that I take the old machines and give them to old people. Maybe it is something for students, you see, I like the idea in another context.” (WP4)</i></p>
	<p><i>“...,the question is, does it have to be a new machine? She actually wants to have exactly the same model again. If older people change their living conditions, e. g. if they move to a home for the elderly, there are a lot of products on the market. These products can be taken back again, just like car leasing.” (WP2)</i></p>
	<p><i>“...you don’t have to buy it, but you pay a monthly price.You have to calculate life expectancy and such things. This is the main business of our business as insurers. So I can say that it costs around 25 Euros per month, you don’t have to worry anymore. That is a special device, and it is high quality...” (WP4)</i></p>

**Scenario 2: Collaborative life-styles**

This approach is based on people with similar needs or interests coming together to share and exchange assets such as time, space, skills, and money (Botsman & Rogers, 2010). It also relates to ‘communities of practice,’ which are “groups of people who share a common concern, set of problems, or a

passion about a topic and who deepen their knowledge and expertise by interacting on an ongoing basis” (Murray et al., 2010, p. 137). Basically, those communities can be described by approaches of decentralization, self-selected participation and diversity of participants (Murray et al., 2010). A strategy to lower the tradition barrier is the use of change agents (Ram & Sheth, 1989). In a simplified scenario, the moderator presented a ‘concierge service,’ where an elderly person offers his or her domestic skills on an ‘exchange platform’ to another elderly person, e.g., explaining the use of a new household appliance or smart devices like tablets. In many aspects, it relates to concepts of ‘ageing together’ (Botero, 2009), “peer-to-peer platforms” (Murray et al., 2010, p. 137), and ‘shared practices’ (Nicolini, 2013) with the overarching aim of bringing people together. The general idea emerged from the primary data findings that confirmed that some elderly could be regarded as active users of new technologies (Joyce & Loe, 2010). In this scenario, the experts particularly valued the positive social aspect. When older adults help other older adults, as far as their capabilities and skills allow, it seems to facilitate empathy (WP1).

*“...I have got older people with different experiences. Some of them want to earn a bit of money and additionally help someone else, too. To be part of the society can become true in such cases.” (WP3)*

The ability to manage, organize, and commercialise this type of sharing seems to be a major challenge; “the fact that family laundry remains a domestic task today rather than a commercial service industry is a significant socio-historical anomaly” (Shehan & Moras, 2006, p. 51). The expert feedback confirmed that service concepts, which are based on peer-to-peer interaction, should be broadly available and efficient. Here a trustworthy agent or organization is required as a coordinating platform: *“They can be employed by the deaconry” (WP3)*. The primary data from the workshop are consistent with the findings from the home interviews with regard to the social influence of technology acceptance. The findings led to a couple of recommendations regarding new communication channels. The importance of technical assistance by somebody trustworthy during operation, maintenance but also before purchase of a new appliance was clearly stated in the home interviews and confirmed by the experts. Here an adaption of the concept of “lead users” (von Hippel, 2005) is described as agents who share their experiences in the neighbourhood community, which could provide a more intensive dialogue. This also suggests

‘top down’ approaches by policymakers and systemic innovations (Murray et al., 2010) to establish infrastructures and ‘sharing platforms’ in the community that are openly accessible. Another consideration has to do with the capabilities of the elderly, “some people have more time than others, or have access to a space, a product or expertise that someone else does not” (Botsman & Rogers, 2010, p. 156). This research showed that older adults have a repository of skills e.g., in doing the laundry or as one focus group participant (FP1, FG3) put it: *“Some can fill their tanks, others can ‘IPod’.”* A business case example is the rather new initiative ‘Space Cowboys - Daimler Senior Experts,’ in which the company Daimler promotes a learning exchange between young staff members and retired employees (see also [www.daimler.com](http://www.daimler.com)). Although a few examples exist, the majority of current business models do not consider the skills of the elderly persons as assets that could be used to fulfil the needs or wants of others. As it appears, individual sharing concepts on a peer-to-peer basis, which provide practical help in daily routines and offer interactions between different age segments, are seen as attractive at first sight.

**Table 43: Participant feedback (scenario 2)**

Participant Feedback Scenario 2	<i>“... it is just like the younger seniors taking care of the older ones.” (WP3)</i>
	<i>“... it is about skills and talents. Everybody has got skills and talents and is able to impart this knowledge more or less. To pass on this knowledge is something I can imagine.” (WP2)</i>
	<i>“...It could be possible to establish such a 'concierge-service' in different city districts or cities. You could say then: Gosh! Maybe someone could help there.” (WP3)</i>
	<i>“I would just look for solutions in such a direction. Instead of a technical solution because they also include a social aspect...” (WP3)</i>
	<i>“Well, that is exactly the solution I’ve been thinking about. However, I think that it is difficult to build up such a platform in many different regions.. .., if you do that in Berlin, and offer that for venture capital I am sure you will get 100.000 Euro. You don’t get this for the other things.” (WP4)</i>

In summarizing the approach, scenarios were used as ‘pathfinders’ (Steen et al., 2014) for exploring conceptual directions, not products (see also templates provided in Appendix 17). However, these sharing approaches have a greater chance to reach a critical mass when they are seen as part of “the routine

accomplishment of what people take to be ‘normal’ ways of life” (Shove, 2003, p. 117). To put it briefly, *“just like car leasing”* as one expert mentioned (WP2). Assessing whether those initiatives have a realistic chance of creating scalable, replicable, and sustainable innovations in social change (Christensen et al., 2009), requires further research into the conditions needed to do so.

### 4.4.3 Findings and implications of research stage 3

A main contribution of this thesis is that it presented an integrated set of findings and implications for various stakeholders, particularly the elderly and the manufacturers of household technologies. The concepts of sharing and collaboration emerged as alternative concepts addressing the issues of later life. Therefore, is necessary to address and explain how the approaches of sharing and collaboration could affect the relationships between the elements of an innovation process in an organization, including initial considerations for commercialisation. For heuristic considerations, the key aspects of this research are aligned to the elements of the Innovation Pentathlon Framework of Goffin and Mitchell (2010), which represents the innovation processes within one organization (see figure below).

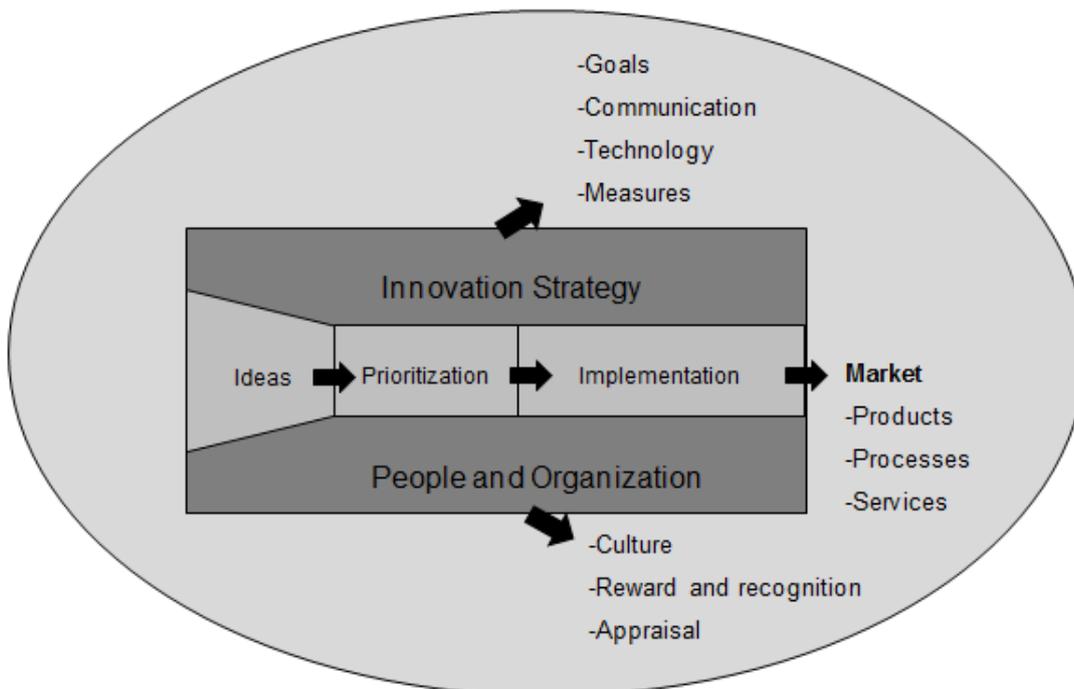


Figure 38: The Innovation Pentathlon Framework (Goffin & Mitchell, 2010, p. 27)

Although the innovation process is described in a simplified way, the framework enables clearer discussions on the practical implications of adopting disruptive innovation for each element in an established organization.

### **(1) Innovation strategy**

The literature indicated that there are 'golden opportunities for silver innovation' (Kohlbacher et al., 2014) for offering disruptive innovations to an ageing customer segment. However, the application of disruptive innovation must be considered selectively. Elderly individuals with usage patterns of 'limited use' and 'low use innovativeness' seem to be appropriate target customers. Product and service concepts that are 'good enough' and affordable, while simultaneously enhancing their capabilities to perform domestic practices were deemed attractive. The same applies to the segment of 'noncustomers,' or older adults not using an appliance, which was the dryer in this study. An extended conceptualization of the phenomenon of disruptive innovation is proposed. It is argued that these innovations can be understood as an integration in practices-as-entities to accomplish a 'job to be done.' In this sense, disruptive innovations create utility in new ways and might imply a strengthening of links to compensate for age-related declines.

### **(2) Ideas**

A first critical stage of creativity involves examining the internal and external environment (Goffin & Mitchell, 2010). "Entrepreneurship is about the discovery and exploitation of profitable opportunities" (Shane & Venkataraman, 2000, p. 217), which favours a constructivist approach (Alvarez & Barney, 2010) to opportunity recognition. In a constructivist perspective, entrepreneurs perceive opportunities different than others (Alvarez & Barney, 2010) because "the information available to an entrepreneur in a constructivist view would be their interpretation of their environment and resources and their unique interpretation of what can be accomplished within the environment and with their resources" (p. 27). A research orientation towards the environment might aid in the recognition of disruptive innovations for small and emerging customer segments (Markides, 2006; Yu & Hang, 2010).

In all of the focus groups and most of the home interviews, there was an underlying and sometimes subtle concern about 'being neglected' by industry. This was made explicit in the second focus group, where participants made accusations against companies of not considering the needs and desires of older adults:

*FP6: "They never think about older people."*

*FP1: "Well, yes, but the people who construct something are young and they assume that everybody can do that."*

*IP5: "Yes well, but they also should, they are also getting old, one day."*

*FP1: "But remember when you were young. YOU didn't think about the old as well."*

*(FG2)*

It seems that many innovations are driven by the technology push and are separated from people's requirements (Steen, 2008). As the literature review showed, the majority of empirical studies suffer from lack of corporate knowledge and/or failure to integrate the "voice of the customer" (Goffin et al., 2012, p. 45). The discrepancy between companies and the older adults requires new participatory approaches (Joyce & Loe, 2010; Peine & Neven, 2011). The work of *Open Innovation* (Chesbrough, 2003) provides an orientation because "open innovation describes the process of harnessing the distributed and collected intelligence of crowds" (Murray et al., 2010, p. 38). To overcome this, the author followed a participatory approach. The author (as moderator) together with the participants, addressed concerns related to envisioning future or alternative situations and practices. Specifically, the findings from the focus groups confirmed that presenting new technologies in a narrative manner facilitates empathy and understanding on both sides. The scenario analysis based on personas proved to be helpful as a 'trigger' to create openness. However, this approach is not straightforward because it required more active participation.

The process and the outcome of this approach also confirmed that the method of participatory design (Steen, 2010), which included the presentation of various stimulus material like fictive user scenarios can facilitate 'co-creation' (Kohlbacher, 2008; Murray et al., 2010) of ideas that are more contextualized to the living realities. Obviously, this approach favours the "widespread

gerontechnological belief that user involvement is the panacea to the problems” (Peine et al., 2015, p. 3). However, to Norman and Verganti (2012), the exploration for innovation must avoid becoming trapped by the dominance of existing products and usage. Special care must be taken when exploring disruptive innovation because customers “are immersed in a socio-cultural context that leads them to interpretations that are in line with what is happening today” (Norman, 2010, p. 38); the use of scenario techniques could be helpful as a countermeasure.

### **Tracing back, history matters**

Seemingly, older people do not get the household appliances they require, because companies fail to acknowledge the opportunities of the emerging older market segment (Peine et al., 2015). While future practices cannot be analysed, past and current technological products are widely available through websites, trade fairs, and magazines (Sackman & Weymann, 1994; Shove & Pantzar, 2005). However, to understand social life and product usage, it is not enough to understand current living conditions (Nicolini, 2013). For the author, it required a considerable grasp of the past, how the practice of doing the laundry was done in the formative period of the participants, and how it evolved to make projections for the future. Analysing existing mental models (Higgins & Glasgow, 2012), which are influenced by experiences with technology in the formative period, revealed something about the future path that should guide the development of new products. As such, higher acceptance can be achieved with a product strategy that fits existing mental models and adapts an “existing product platform” (Herstatt et al., 2011, p. 1). For understanding this dynamic, a broader analysis of the target practices’ history has proven essential (Kurz, 2006; Shove et al., 2012).

### **(3) Prioritization**

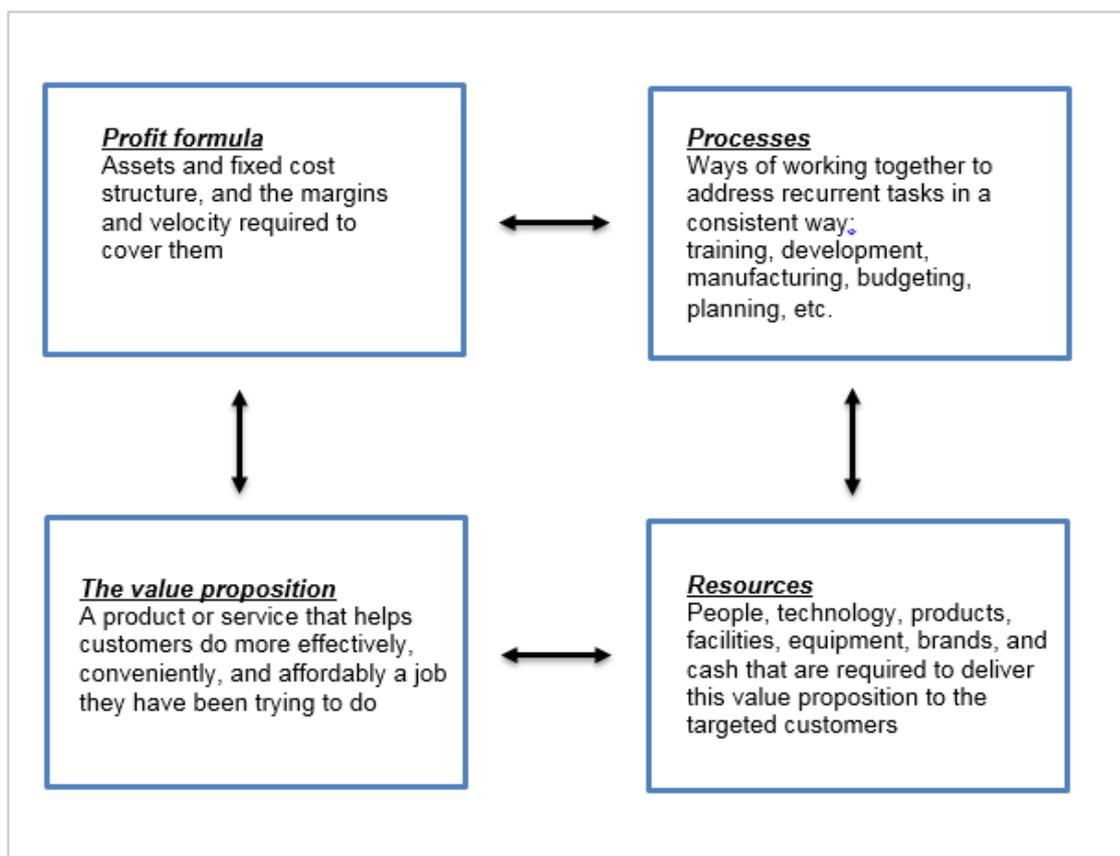
In line with a constructivist paradigm, the author suggests an outcome-driven innovation approach (Bettencourt & Ulwick, 2008) and open innovation (Chesbrough, 2003), which can be achieved by involving multiple stakeholder perspectives. This prevents what Prahalad and Bettis (1986) regarded as the ‘dominant logic’ of a company, which is “a way of defining and managing the world and a basis of action in that world” (p. 492). Further, gathering information

only on mainstream customer needs and responding to such needs is detrimental to disruptive innovations (Christensen & Raynor, 2003; Raynor & Christensen, 2011). In this line of thought, von Hippel (2005) replied: “I do agree to Christensen and others that a manufacturer may well receive mainly requests for sustaining innovation from its customers” (p. 145). Daneels (2004) underlined that the lead user technique is the preferred approach to identify disruptive technologies. The participatory approach of the lead user concept (von Hippel, 2005) can be extended to “technogenarians” (Joyce & Loe, 2010), who are older users actively and creatively engaged in new technology. Possible candidates could comprise retired engineers or technology enthusiasts (Lew et al., 2015) to point out whether prototypical product concepts have been ‘overdesigned’ (Kim & Mauborgne, 2005). It is obvious to see that a new marketing competence is required to revitalize brand relationships with customers that the company has not previously served (Danneels, 2004; Lew et al., 2015). The primary data from the focus groups also gave rise to a new kind of commercial disruptive approach that is not technology-oriented, like collective consumption and sharing. To Botsman and Rogers (2010), product service systems (PSS) are disrupting traditional industries based on models of individual private ownership. PSS is an integrated combination of products and services (Baines et al., 2007; Mont, 2001). It embraces a service-oriented competitive strategy and might help to differentiate from competitors who simply reduce prices (Baines et al., 2007). Johnson et al. (2008) referred to the high-end power tool company Hilti as an example of a disruptive innovation that changed the business model from selling tool *use* instead of tools themselves. “The customer is paying for using an asset, rather than its purchase, and so benefits from a restructuring of the risks, responsibilities, and costs traditionally associated with ownership” (Baines et al., 2007, p.1). There are many scenarios where the market seems to be ripe for this type of disruptive innovation. As this study has revealed, this is the case, when the product has ‘high idling capacity,’ when the product has a ‘limited use’ because of life course changes, or when high start-up or purchasing costs for products inhibit purchases (Belk, 2014, Botsmann & Rogers, 2010, Matzler et al., 2015; The Economist, 2013). Selling a used machine requires different know-how and sales skills from the retailer. One older woman stated her experience:

*“He opens the machine for me in the back and shows me if the belts are all right, because they are the first things to get broken.”  
(FP2, FG2)*

### **(4) Implementation**

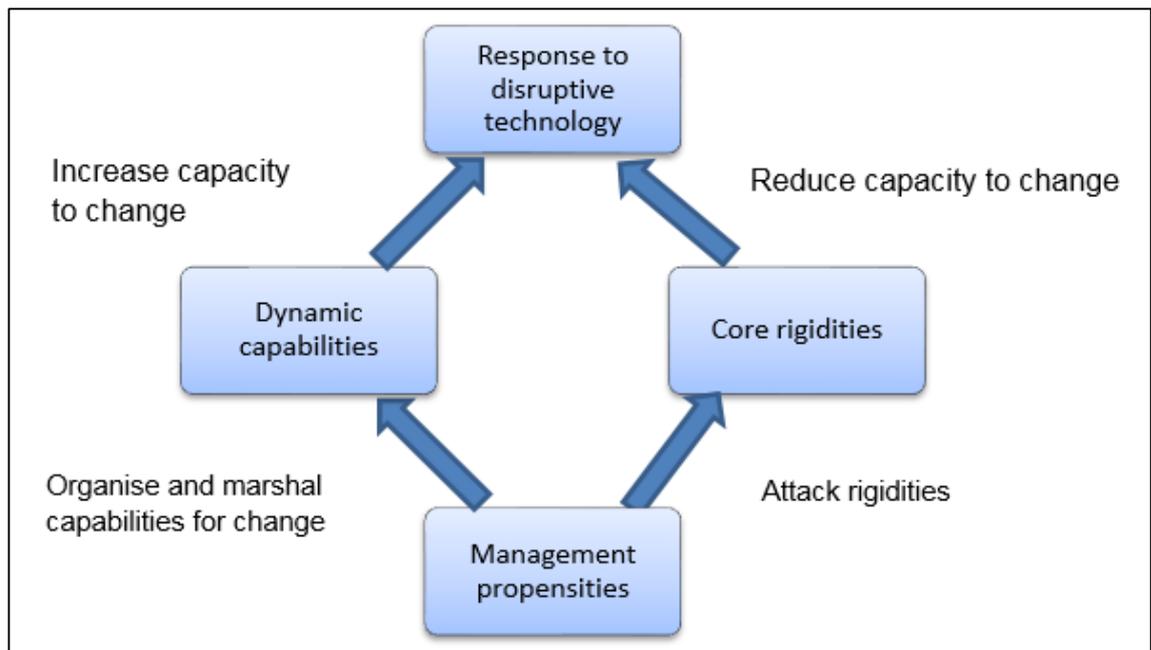
Much literature (Christensen & Raynor, 2003; Govindarajan et al., 2011; Prahalad, 2005; von Hippel, 2005; Yu & Hang, 2010) has elaborated on the customer-orientation of a company towards its mainstream (current) and emerging (potential) customers because, “the exploitation of new opportunities may require a company to adapt its current business model” (Kohlbacher et al., 2014, p. 8). Christensen and Raynor (2003) also suggested setting up an autonomous organization or a separate unit to develop and commercialise the product. However, the literature does not support such an extreme perspective (Kohlbacher et al., 2014; Markides, 2006; Yu & Hang, 2010). New entrants, with no existing customers, have lower opportunity costs than incumbents (Hang et al., 2014); however, they lack the resources and the customer loyalty. This has far-reaching implications for the application of the theory to an ageing segment because new entrants will have difficulty succeeding. A business model change is also discussed at length in the literature of disruptive innovation, which is closely related to discussions about low-income markets, with a consensus that serving emerging customers requires in both cases a different business model approach (Chesbrough & Crowther, 2006; Christensen, 1997, 2013; Christensen & Raynor, 2003; Govindarajan et al., 2011; Prahalad, 2005; Raynor & Christensen, 2011). The literature on business model innovation in low-income markets and for disruptive innovation stresses the importance of revamping organizational cost structures. As has been stated in many publications (Anthony et al., 2008; Christensen & Raynor, 2003; Christensen et al., 2009), disruptive innovation is primarily a business model problem. The inability of established companies to reconfigure organizational structures and competences toward developing disruptive innovation directly impacts a company’s ability to respond to intensified competition (Henderson, 2006; Lucas Jr. & Goh, 2009; Yu & Hang, 2010). The implications of adopting disruptive technologies successfully are far reaching, as it requires more than developing and introducing a new product line. In a simplified illustration a business model can be regarded as an interdependent system basically composed of four components, as illustrated by Christensen et al. (2009, p. 10).



**Figure 39: Elements of a business model (Christensen et al., 2009, p. 10)**

While the starting point in the creation of a business model is the value proposition, it obtained the main attention in this thesis. Over time, the business model that has emerged determines the sorts of value propositions that the company is able to deliver. As a consequence, the only value proposition a company can successfully take to market is one that best fits the existing resources, processes, and profit formula (Christensen et al., 2009).

Lucas Jr. and Goh (2009, p. 47) established a framework for responding to disruptive change. The illustration below shows the relationship of dynamic capabilities and core rigidities with a company's capacity to respond to disruptive technology. The illustration visualizes the rather high organizational efforts required. As such, making it a matter of entrepreneurship (Alvarez & Barney, 2010; Chesbrough, 2010) rather than a designerly approach (Steen et al., Bulis, & Williams, 2014)



**Figure 40: Response to disruptive technology (Lucas Jr. & Goh, 2009, p. 47)**

Separating the duality of disruptive outcome from Christensen's theory helps to better understand the implications of market disruption. Market disruption is facilitated by a transformation of the market segment preferences towards new product dimensions or characteristics of performance (Schmidt & Druehl, 2008). The failure of established companies to react is attributed to the combined effects of organizational constraints and management propensities (Christensen & Raynor, 2003; Lucas Jr. & Goh, 2009). As it appears, process innovation is needed to complement disruptive and social innovations to facilitate ageing-in-place (Howitt et al., 2012).

For an established company, setting up a completely new organization could be too risky considering the initial (niche) market volume (Chesbrough, 2010; Markides, 2006). However, the long term relationship with older customers, who expressed a high brand loyalty in the research, is a strong asset and competitive advantage for established companies when compared to new entrants. The experts in the focus groups underscored that the existing retail structure and service level of the established companies are important to elderly customers. A solution to the innovators dilemma could be "ambidexterity" which is the ability of companies to successfully balance exploration and exploitation (Ramdorai & Herstatt, 2013, p. 10). In this line of thought, a constructivist perspective of opportunity recognition (Alvarez & Barney, 2010) favours collaboration and business alignment with other parties (Kohlbacher et al.,

2014). Yu and Hang (2010) recommended that “disruptive innovation could benefit from collaboration between incumbents and start-up firms” (p. 13). In contrast to Christensen and Raynor (2003), Govindarajan et al. (2011) underlined that a mainstream and emerging customer orientation can co-exist, “in fact, being mainstream and emerging customer-oriented are compatible” (Govindarajan et al., 2011, p. 131). A constructivist perspective of opportunity recognition (Alvarez & Barney, 2010) would favour a strategy of experimentation within pre-defined affordable losses (Chesbrough, 2010) based on open innovation and collaboration, which would help to identify emerging markets. Undertaking active tests to explore emerging markets with new potential configurations of the elements of a business model would allow a company to learn ahead of the rest of the market (Chesbrough, 2010; Osterwalder & Pigneur, 2011). Both activities, to collaborate with start-ups *and* with lead users could stimulate new, unexpected dialogues in product development and prevent to follow the dominant corporate thinking too closely. This participatory process could be viewed as a starting point to “jointly envision” (Steen, 2008) future products and to identify the “value proposition” as the focal point of attention to develop business maps (Blank, 2013; Osterwalder & Pigneur, 2011), such as the “business model canvas” (Osterwalder & Pigneur, 2011). That tool (see also Appendix 17) could stimulate discussions about the potential configuration of business elements, their relationships, and the underlying processes. This allows for becoming a source of experiments that consider alternate configurations of the elements and processes. One possibility could be that flexible start-ups operate primarily at the front-end or the commercial side. The established company could operate at the back end and provide customer service and resources for marketing campaigns and opportunity exploitation.

To sum up, an innovation strategy based on a constructivist attempt of opportunity recognition favours an entrepreneurship, which is consistent with the basic assumptions of a social constructivist paradigm (Alvarez & Barney, 2010). It favours an entrepreneurship based on collaboration with start-ups and participatory methods like the lead users concept. It also directs the attention to social practices and the job a consumer has to do and departs from an excessive competition-based strategic thinking (Kim & Maubergne, 2005) and a “competition-driven” design approach (Norman, 2013, p. 263). This business

model provides a platform to experiment with new concepts related to sharing of practices and collective consumption.

### **(5) People and organization:**

Companies identifying demographic change as a major and relevant opportunity have to acknowledge different norms guiding the customer relationship management. The findings from the expert workshop confirmed that employees need to have the “right empathic capabilities and customer orientation toward older people” (Kohlbacher et al., 2014, p. 6). However, as one expert (WP4) mentioned, the high level of personal involvement and empathy required might be rather demanding:

*“I wouldn’t do that in real life, because I have great respect for all this... We move into a very personal area, in such an important area. ... but there is no alternative. It is quite easy, if I have to wash someone, I have to wash someone and if I have to listen to somebody’s problems, I have to listen. This is already part of the solution. There is no alternative.” (WP4)*

Christiansen, Gasparin and Varnes (2013) suggested that those involved in open innovation need both a broad knowledge of the various potential elements of an open innovation effort and a flexible attitude toward their application. It also requires empathy as mentioned by one expert:

*“The understanding of older adults for other older adults is naturally a different one, the sensibility, the perception of the other, as when a young woman is doing it...”  
(WP 2)*

In summary, the Pentathlon framework (Goffin & Mitchell, 2010) provides a helpful means of visualizing and assessing aspects of implementing disruptive innovation management within an established organization. It can be used as a diagnostic tool. However, the relative importance of the five different elements is difficult to assess and care must be taken in concluding whether performance in one area is sufficient.

The author refined the framework (Figure 41 below) that has heuristic value for commercialising disruptive innovations by established companies. It summarizes the final research objective (RO3) as discussed in this section:

**RO3: To suggest an entrepreneurial approach serving current mainstream customers and new (potential) elderly customers embedded in a new business model framework**

To overcome the innovator's dilemma the revised framework describes the process of a dual strategy ("ambidexterity"). By following an exploitation strategy with the existing business target at mainstream customers (MCO) and experimentation with new disruptive innovation attempts, by aligning the existing business with external partners. The latter one follows an emerging customer orientation (ECO). In this thinking, the author adapts the approach of Markides (2006), "established companies should aim to create, sustain and nurture a network of feeder firms - of young, entrepreneurial firms busy colonizing new niches" (p. 23). This could be seen as an initial step to penetrate the market with 'good enough' services from the bottom upwards, which eventually threatens established competitors (Christensen & Raynor, 2003).

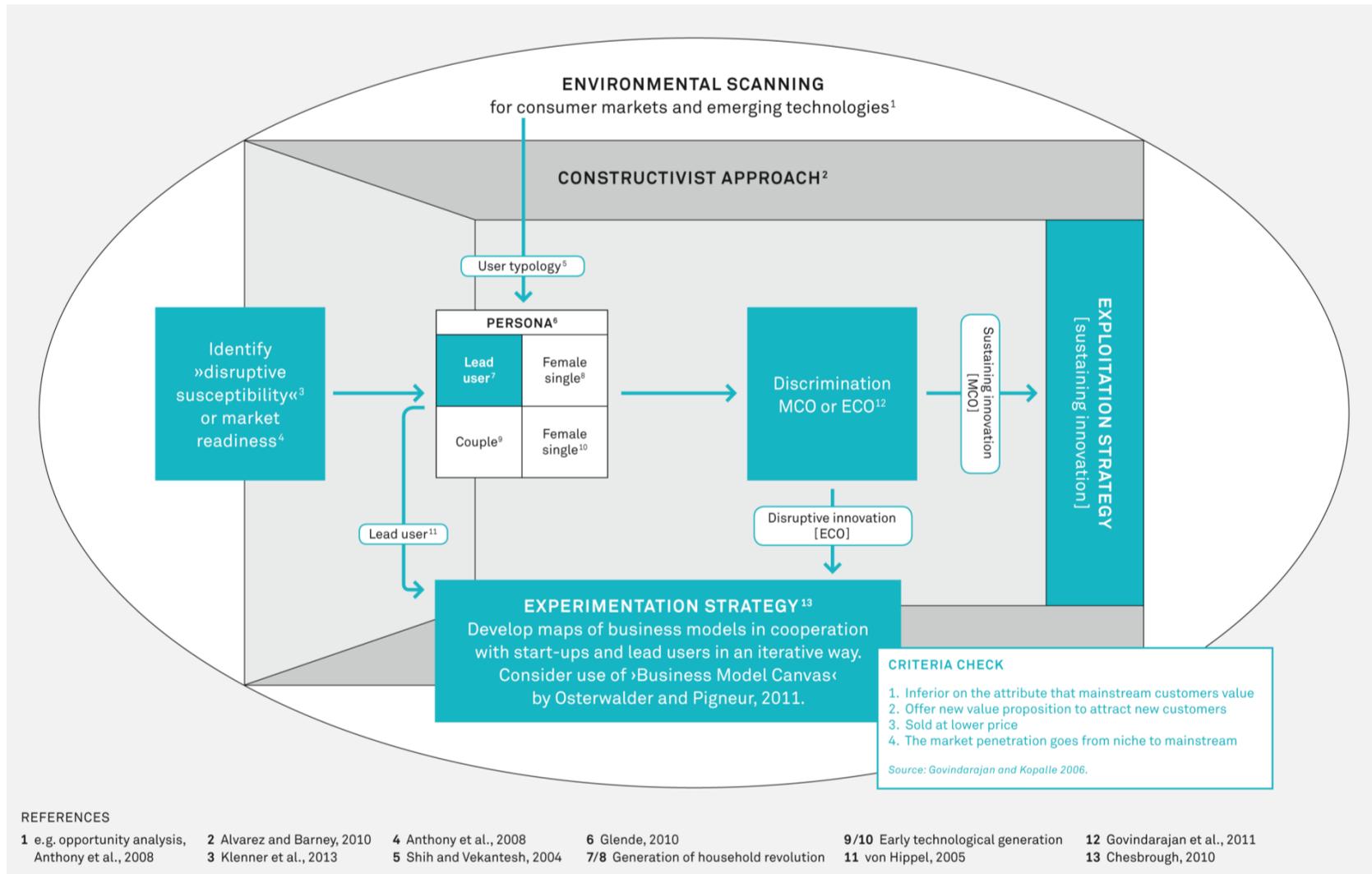


Figure 41: Business model framework of dual strategy (based on Goffin & Mitchell, 2010)

### **4.5 Final conceptual research framework**

The research has extended the model by Shih and Venkatesh (2004), which was derived from a quantitative study about usage of personal computers. Thus, adaptations and extensions were required in relation to household technology and the specific situations of older users. This resulted in a synthetic framework that melds and extends distinct conceptual elements from separate theories. The synthetic framework consists of three key components: dimensions/determinants, user profile, and outcomes. A further component illustrates areas for a possible application of the disruptive innovation strategy. In the following, the main extensions and adaptations to the original conceptualization of Shih and Venkatesh (2004) are highlighted.

#### **4.5.1 Dimensions and determinants**

The initial research model was created as an extension of the Use Diffusion model developed by Shih and Venkatesh (2004). It offered a preliminary list of coding categories, which was used as a starting point for further refinement. The author chose a deductive-inductive approach to analyse the text data. The transcripts from the home interviews, expert interviews, and focus groups were intended to validate and refine the concepts from the literature review and the preliminary initial model. According to Kuckartz (2012), in qualitative content analysis it is possible to start with deductive categories followed by a further refinement and a creation of subcategories (see also Figure 27, p. 123). Thus, directed content analysis is the most appropriate choice, as the research study starts with existing pre-defined categories from the initial research model (Hsieh & Shannon, 2005), where “the researcher interrogates the data for constructs and ideas, that have been decided in advance” (Easterby-Smith et al., 2008, p. 173). In this way, existing research benefits from further descriptions by adding, refining, extending, and enriching the initial research framework (Hsieh & Shannon, 2005). In addition, the approach offers supporting and non-supporting evidence of a theory by predefining categories and codes (Hsieh & Shannon, 2005). Furthermore, “the main strength of a directed approach to content analysis is that existing theory can be supported and extended” (Hsieh & Shannon, 2005, p. 1283). The initial coding scheme consists of four

dimensions (themes) that may affect the patterns of use Shih and Venkatesh (2004) described:

1. The household social context in which the elderly person operates
2. The technological dimension, which is based on the characteristics associated with the technology
3. The personal dimension, e.g., use innovativeness
4. External dimensions, e.g., external communication and media exposure

The research confirmed all of the four dimensions (household social context, technological dimension, personal dimension and external dimension) that were established in the original model by Shih and Venkatesh (2004). During this deductive process, the author immersed himself in the data and allowed new themes and subthemes to emerge inductively from the data (Kuckartz, 2012). In addition, each of these dimensions consists of pre-defined subcategories (determinants) affecting usage patterns. In a first step, by reviewing and analysing the literature (see Chapter 2), new determinants were added to the existing ones. Life course events and technical self-efficacy were identified from the literature review as important determinants explaining age-related differences in technology use. Those specific determinants were added in the initial model to the personal dimension of the original model and have been validated in the research. In a further step, determinants from the original model were adapted (e.g., complementing prior experience with habits). The determinants that were not confirmed in the research were deleted (e.g., external technological access). In a further step, during the course of deductive-inductive text analysis, new determinants (e.g., price value) emerged inductively from the data and were added to the refined model. As discussed earlier, the determinant 'selection, optimization, and compensation' emerged inductively from the research. It is defined as a kind of 'life management strategy' (Freund & Baltes, 2002), which helps to explain why differences in technology use occur. According to Freund (2008): "selection, optimisation, and compensation can be seen as key concepts for understanding successful ageing" (p. 94). An additional important determinant, which emerged inductively from the research, is the 'socio-technical arrangement' of products, which was added to the dimension household social context. This determinant relates to the context-of-

use that may impede or support the use of household technology (Rogers & Fisk, 2010). The home interviews and focus group discussions revealed a surprisingly common usage barrier: The dominant wish for all of the participants is to save energy costs expressed in statements like “I never wash small loads,” and “we wash too often.” For the participants, washing small loads economically was the most worrying issue with regard to washing machine technology. Consequently, the author added price value to the technological dimension and adopted the definition provided by Venkatesh et al. (2012), who defined “price value” (p.161) as consumer’s cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them. Based on the research findings, further external determinants were added that affect usage patterns. In particular, environmental influences (like the weather) needed to be considered. For many participants, good weather meant drying clothes in the fresh air and not wasting energy costs. In addition, following norms and conventions of how to do the laundry (e.g., to use low wash temperatures, not to wash half loads) affects use patterns. Upbringing and experience with housework during the participants’ formative years had particular influence on their attitudes. In some cases, beliefs ingrained over 50 years ago, endure today. The long-term relationship with a brand may also impede or support use patterns. Previous studies (Mathur et al., 2005) have suggested that life events in later life lead to changes in brand preferences. However, this research showed that “people sometimes form a very intimate bond with brands” (Aggarwal, 2004, p. 87) and an emotional relationship to the washing machine that is usually associated with very close friends or family members (Aggarwal, 2004). This may explain why some older consumers are resistant to adopt a ‘new’ (unfamiliar) brand.

While Shih and Venkatesh (2004) “did not find major demographic differences between the groups” (p. 69), this research found essential differences among older consumers in terms of technology use and interest in innovations. A possible explanation that some older consumers are more resistant to an innovation is that it is “not compatible with existing workflows, practices, or habits” (Ram & Sheth, 1989, p. 7) and that it may disrupt the current routines. This thesis posits that innovation resistance is a “normal, instinctive, response of consumers” (Ram & Sheth, 1989, p.11). It supports previous studies (Rogers & Fisk, 2010; Shove et al., 2012) which suggest that the interplay of older

adults' skills and capabilities, the technological system, and the task being performed need to be considered by managers and designers, rather than the technology in isolation.

The table below was taken from MAXQDA ('Code-Matrix Browser') and provides an illustration of the codings carried out in the documents (e.g., interview transcripts, field notes) of different research stages (e.g., home visits). From the illustration, it is possible to identify in which research stage which dimensions and determinants occur. The confirmation of a pre-defined determinant (from the initial model) or the emergence of a new determinant in a specific research stage is illustrated by a 'blue knot.' In addition, the 'relative importance' of a determinant (frequency of codings per research stage) is indicated by an enlarged 'blue knot' (e.g., price value in home visits). Determinants (e.g., external technology access) that were only mentioned in one research stage and had a low relative importance were deleted.

Table 44: Output MAXQDA (development of codings through different research stages)

Codesystem	Home visits (n=13)	Expert interviews (n= 6)	Care Center (n=2)	Focus groups with older adults (n= 21)	Expert workshop (n=4) incl.conferences
UD Pattern / User typology					
External dimension (confirmed)	•			•	
External communication (confirmed)	•	•		•	
Family exposure to target media (integrated in ext.comm.)	•				
Shared conventions (new)	•	•	•	•	•
Brand relationship (new)	•	•		•	•
Environmental influences (new)	•			•	
External technology access (deleted)	•				
Technological dimension (confirmed)	•			•	•
Technological sophistication (confirmed)	•	•	•	•	
Complementary and competing activities (adapted)	•			•	
Price value (new)	•	•			•
Personal dimension (confirmed)	•		•	•	
Frustration with technology (confirmed)	•	•		•	
Use innovativeness (confirmed)	•	•		•	•
Technical self-efficacy (new)	•	•		•	•
Life course (new)	•	•		•	
SOC (new)	•	•		•	
Household social context (confirmed)	•		•	•	
Household communication (confirmed)	•	•	•	•	•
Prior experience and habits (adapted)	•	•	•	•	
Socio-technical arrangements (new)	•	•	•	•	
Competition for limited resources (deleted)	•				

To illustrate the outcome in a concise format, the following adapted figure will be incorporated into the final conceptual framework. The white boxes indicate new categories that were not considered in the original model by Shih and Venkatesh (2004).

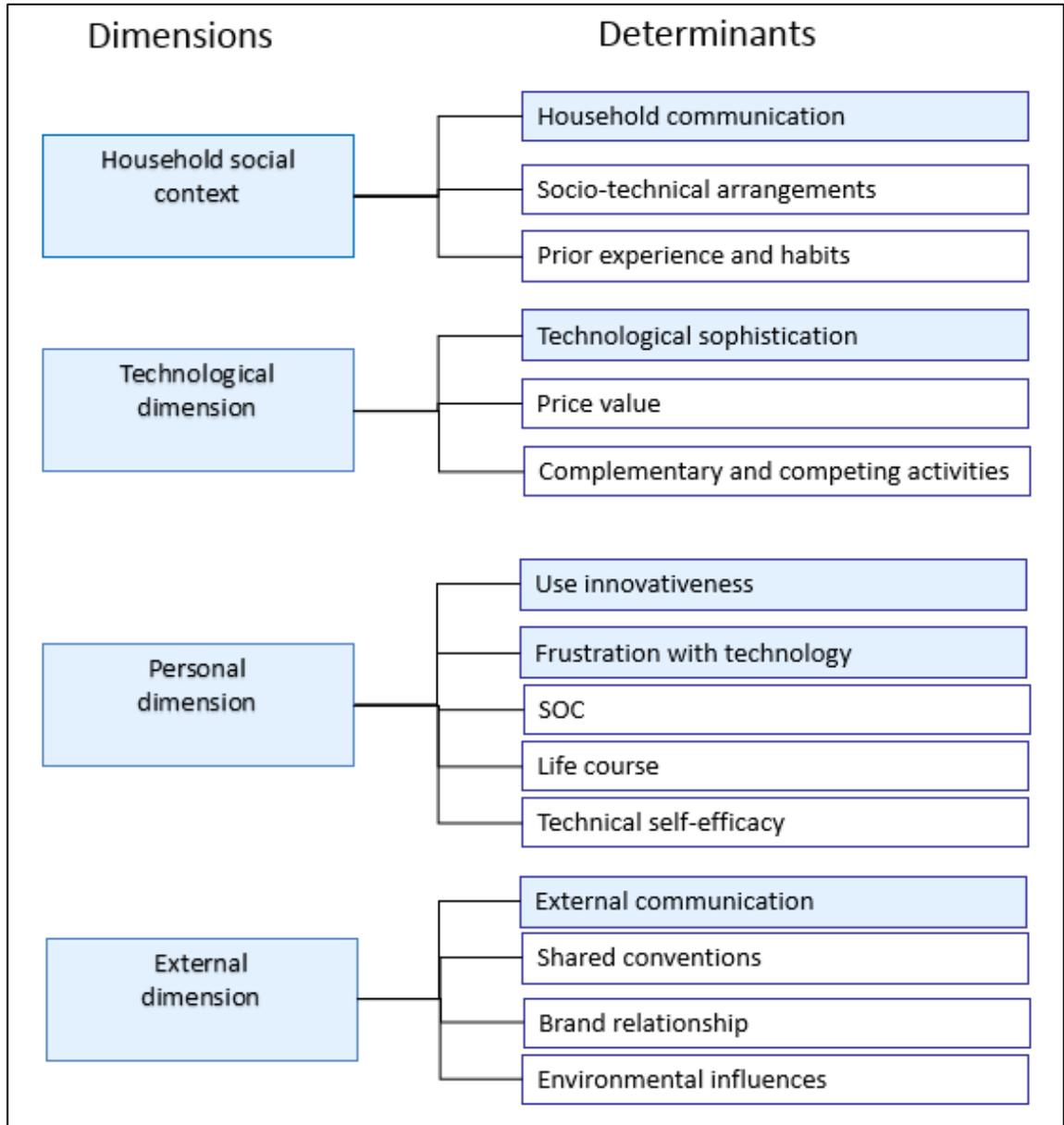


Figure 42: Dimensions and determinants used in conceptual framework (new to original UD theory are indicated by white box)

### 4.5.2 User profile

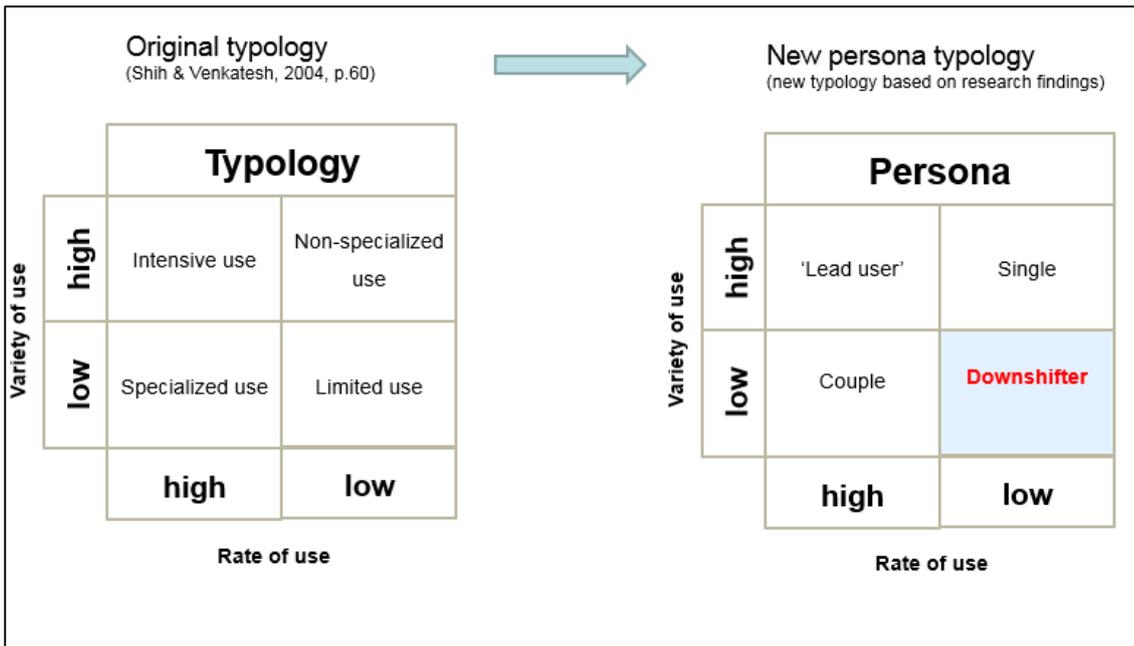
Market segmentation and targeting are the foundation of market strategy (Rogers, 2003; Slater & Mohr, 2006). Having no specific user in mind leads designers and managers to “feature creep” (Norman, 2010; Steen, 2008), as all possible use scenarios are taken into account. “Before developing marketing

strategies, marketers should consider segmentation criteria which help form segments that respond differently to marketing strategies” (Moschis et al., 1997, p.292). The limitations of age as a meaningful predictor of usage and consumption behaviour have clearly been acknowledged in literature (Amatulli et al., 2015; Chen & Chan, 2011; Kohlbacher & Cheron, 2012; Mathur et al., 2005; Moschis et al., 1997) because “the older consumer market consists of older people who exhibit a great deal of variability with respect to the way they look, think, and act” (Moschis et al., 1997, p.284). Slater and Mohr (2006) linked Rogers’ adopter segmentation with Christensen’s different strategy types. This research links the user segmentation created by Shih and Venkatesh (2004) with different strategy types. User typology plays a key role in the original UD model (Shih & Venkatesh, 2004) because it is assumed that different user types have different inclinations for future product acquisition. In so far, it is helpful as a strategic tool for product and innovation management to overcome innovation resistance (Ram & Sheth, 1989). While Shih and Venkatesh (2004) “did not find major demographic differences between the groups” (p. 69), this research found significant differences in technology use among older consumers. Therefore, the original user typology developed by Shih and Venkatesh (2004) has been adapted. This thesis strongly proposes to synthesize and to enrich the original use typology by Shih and Venkatesh (2004) with a life stage description (see persona profiles in Appendix 7) of older adults. That synthesis led to a new and unique segmentation approach that facilitated the identification of the main target segment for disruptive innovations. As the primary data indicate, the experiences of the user in the formative period affect the use innovativeness that influences variety of use. In addition, the determinant life course has a major influence on rate of use. As consequence, users with low use innovativeness in combination with low rate of use, due to certain life events e.g., death of a spouse, seem to be the most receptive target group for disruptive innovations. As it appears, older persons with ‘limited use’ patterns are the ideal segment for the application of disruptive innovations. Their use innovativeness is low, which affects variety of use. In contrast, ‘intense users’ prefer sustaining to disruptive innovations. They have a high use innovativeness that shows commonalities with technogenarians (Joyce & Loe, 2010) and innosumers (Peine et al., 2014). Both terms describe segments of older adults with a high use innovativeness that are proactively using technology. The latter

one specifies older adults as co-creators of configurational technologies (e.g., in setting up a smart home). Although, the age profile of the 'intense users' was not dramatically different from other users, insights about usage patterns in combination with life-style aspects indicate how different they are regarding the perception of new technologies. This research suggests that usage patterns are dynamic because "many life events are markers of life transitions, they are expected to result in changes in consumer behaviour due to the person's need to enact new roles defined by these events" (Mathur et al., 2005, p.131). In other words, instead of defining the target group in demographic terms (age, gender, living status, etc.) or in product usage terms (e.g., rate of use, variety of use) a combination of both aspects demonstrates the diversity and the variability of this consumer segment.

For this research, segmenting the ageing consumer market based on a combination of usage patterns and personas has a two-fold goal. First, since most managers and designers are probably much younger than the target group, it facilitates empathy and provides an orientation about the capabilities and willingness of potential older users to adopt certain products. Consequently, imagining a specific user would help to prevent overloading of unnecessary functions (Markides, 2006). In this way, it helps managers and designers to identify and avoid product overengineering (Kim & Mauborgne, 2005; Markides, 2006) and potentially useless features for certain types of elderly users. Second, if useless specifications are identified and omitted, then household appliances become simpler and more affordable, which opens the way for disruptive innovations (Markides, 2006). This new persona typology (see table below) takes a central position in the synthetic framework. The detailed description of older adults' personal characteristics and the related use patterns (variety of use and rate of use) build a basis to define personas. By combining the two useful concepts, it was possible to create a novel market segmentation approach that respects the market diversity of the elderly segment.

**Table 45: New persona typology (adapted from Shih & Venkatesh, 2004)**



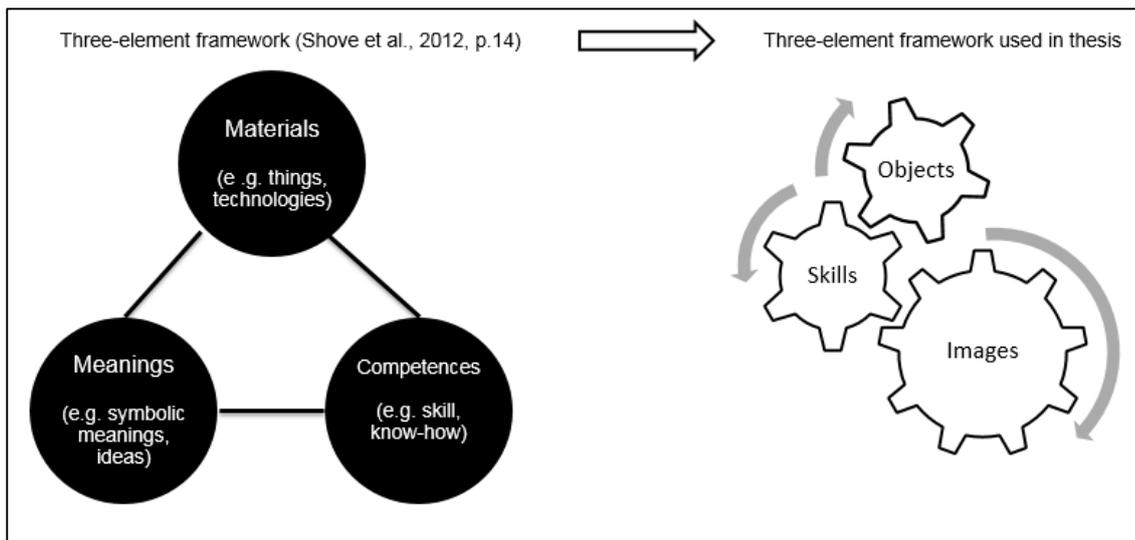
The key lessons and insights that were outlined from the descriptions of personas (see Appendix 7) and the different usage patterns can be used to guide product managers and designers through new product developments. From this new segmentation typology, it is possible to identify the specific segment to which disruptive innovation could be addressed in order to lower usage and value barriers. Particularly, elderly (female) singles with 'limited use' patterns (see blue box in the table above), usually approaching the 'Fourth Age,' are seen as an appropriate segment for disruptive innovations. Their "I don't need that anymore" consumer behaviour can be acknowledged as the voluntary simplicity of life (Shankar et al., 2006) or interpreted as a means of self-care (Foucault, 1988; Grebe, 2013). The author has termed this 'less is more' consumer segment as 'downshifter.'

The new segmentation approach suggests different levels of interest in innovation adoption among older adults. Thus, it represents the foundation for matching the selected target market segment with the most efficient market strategy, which is either sustaining or disruptive innovation. In other words, in order to lower innovation barriers, new products for older adults must be "marketed strategically with different appeals to different segments" (Shih & Venkatesh, 2004, p. 70). On a more abstract level, this research suggests that consumer insights about the life stage in combination with usage patterns are better predictors of innovation adoption than segmentation approaches based

on (chronological) age (Venkatesh et al., 2003) or adopter profiles (Rogers, 2003). Therefore, this thesis strongly recommends using the new segmentation approach as a guideline for product development.

### **4.5.3 Outcome**

The synthetic model (Figure 44) differs from the original work of Shih and Venkatesh (2004) because the author introduced a completely new relationship associated with the outcome of technology use. In general, technology use is not the goal of an activity, but the means (Bagozzi, 2007). As mentioned earlier, Shih and Venkatesh (2004) applied the model to the use of personal computers. The authors suggested that the outcome of technology use is the “satisfaction with technology and perceived impact of technology” and an “interest in new (futuristic) technologies” (p. 63). The older adults in this research vehemently underlined the desire to be able to do the laundry themselves which confirmed that practices create consumer demands (Warde, 2005). This research defines the outcome from a practice perspective and uses the ‘successful accomplishment of domestic practices’ by the older adults as the fundamental goal of household technology use. However, the three-element framework (materials, competences, meanings) of Shove et al. (2012) is not yet established as an applied set of tools in consumer research (Spotswood et al., 2015). This approach is in line with Christensen et al. (2009) who declared that the job a customer has to accomplish should be the core interest of marketing analysis. In doing so, the ‘successful accomplishment of domestic practices’ is illustrated in the synthetic model by the three-element framework. It is used in an adapted form as ‘interrelated cogs’ representing the dynamic interaction of the elements of a practice (see figure below).



**Figure 43: The three-element framework used in this thesis**

The author adapted the three-element framework from Shove et al. (2012), which deconstructs the target practice in different elements. The author prefers to use the terms ‘objects,’ ‘skills,’ and ‘images’ because they are common expressions in innovation management and used in previous studies (Chipchase & Steinhardt, 2013; Norman, 2013). The skills and capabilities of older adults take a centre position in the framework because “things and their use” (Reckwitz, 2002, p. 249) are endangered when the older adult is not capable anymore to accomplish easy operations. It considers the physical burden or the embodiment of consumers (Lai et al., 2008). Seen in this way, innovative products or services are not simply solutions to existing consumer ‘desires’ (e. g., modern design) because they, and the practices of which they are a part, have transformative potential in the life of older adults (Shove, 2003). The research posits that domestic practices are a pre-requisite to support independent living. As such, a major implication of the authors’ three-element framework is the importance of explicitly considering objects (products, technologies, or services) to facilitate social domestic practices (skills) to support independent living (image). This is symbolized in the synthetic model (Figure 44) by an enlarged ‘image cog.’ By viewing it from a more abstract level, the ‘successful accomplishment of domestic practices’ (illustrated by interrelated cogs) is the main ‘goal’ or outcome of household technology use. Therefore, Figure 44 directs the attention of innovation management to the three-element framework.

### **4.5.4 Potential application of disruptive innovation**

The final conceptual model has considerable heuristic value as it helps to clarify the extent to which disruptive innovation could be applied to the segment of elderly consumers, which has been proposed by a variety of scholars (Herstatt et al., 2011; Kohlbacher & Herstatt, 2011; Kohlbacher et al., 2014; Yu and Hang, 2010). The main critique by various scholars relates to the lack of consumer orientation (Daneels, 2004; Selhofer et al., 2012; Yu & Hang, 2010) and a lack of understanding of how to anticipate disruptive innovation (Adner, 2002; Paap & Katz, 2004), which includes R & D challenges (Yu & Hang, 2010). The synthetic framework incorporates the identification of different user patterns in order to provide more accurate user representations in the form of fictive personas. From here, the development of new products and commercial activities can be derived that are much more user specific as opposed to general marketing approaches. At a more abstract level, it helps to guide managers to define specific types of innovation approaches, either sustaining or disruptive innovations.

#### **Downshifters**

As it appears, “A highly discontinuous innovation ... creates a great degree of change for the consumer and is likely to encounter high resistance” (Ram & Sheth, 1989, p. 7). As such, the author explored under which conditions disruptive innovation could be a more effective conceptual guideline for innovation management to address the capabilities and needs of elderly consumers, as opposed to a technology-push strategy (Kohlbacher & Cheron, 2012; Kohlbacher & Hang, 2011; Kohlbacher & Herstatt, 2011). Older consumers’ resistance to innovations may be reduced when the new product overcomes usage barriers (Claudy et al., 2015; Heidenreich & Spieth, 2013; Ram & Sheth, 1989). Therefore, it is necessary to thoroughly analyse older adults’ usage patterns, so that innovations may be developed that are compatible with current habits and routines (Heidenreich & Spieth, 2013; Ram & Sheth, 1989; Rogers, 2003). This research confirms that innovation acceptance has a greater chance when the product is perceived as consistent with existing usage patterns, which relates to Rogers’ (2003) criterion of compatibility. As the research shows some older adults can be characterized for their limited use

patterns and their voluntary 'less is more' consumer behaviour. This research confirmed previous studies that consumers tend to have a general preference for status quo solutions (Claudy et al., 2015). By using the washing machine repeatedly over a long period of time (sometimes even 20 years), some older consumers formed strong attitudes and habits toward existing products and processes. The research suggests that unfamiliar additional functional complexity causes 'fear' of making mistakes in operating the product (see also 4.1.6). This might contribute to the resistance to change. For instance, the focus groups discussions underlined the findings of Bagozzi and Lee (1999) that some innovations are perceived more as a threat than an opportunity. As the research has shown, those older adults want to remain independent, but they were very sceptical about multifunctional, smart technologies, and product functions being forced on them. This negative perception has led to the decision of the participants not to adopt them. In this context, the theory of disruptive innovation, which suggests simpler, more convenient and affordable products, seems to be an appropriate approach to address the capabilities and needs for this consumer segment. By focussing on this specific segment, which the author termed 'downshifter,' it is possible to identify two directions for innovation management. In first direction, the company follows a traditional 'exchange relationship' (Aggarwal, 2004) by offering simpler, more affordable appliances that are compatible with current usage behaviour. The older adults expressed a need for advanced, simpler, more affordable appliances that have a 'familiar' character to them. However, as the research has shown, different types of innovation barriers require different strategies to overcome innovation resistance. Technology is not the only key enabling strategy for accomplishing domestic tasks, thus ageing-in-place. Support, in form of peer-to-peer support, where "people give benefits to others to demonstrate a concern for them and to attend to their needs" (Aggarwal, 2004, p. 88) also emerged as a decisive strategy from the research. As mentioned earlier, product service systems (PSS) provide an integrated combination of products and services (Baines et al., 2007; Beuren et al., 2013; Mont, 2001). New service concepts that depart from the ownership of appliances could be considered to overcome the value and risk barrier of an innovation (Ram & Sheth, 1989). They have the potential that older consumers "get added value through more customized offers of a higher quality" (Mont, 2001, p.4). To reduce 'fear' and anxiety it is crucial to

build up trust in new technologies. As in previous studies (Coughlin et al., 2007; Ehrenhard et al., 2014; Kruse et al., 2012; Wolfe & Synder, 2003), this research has also shown that communication and training is crucial for the technology adoption of older adults. To overcome the 'functional' risk barrier (e. g., fear of making operating mistakes), this research suggests implementing change agents (Ram & Sheth, 1989). As an example, experts (EP3 and EP5) recommended peer-to-peer concepts, where younger older adults assist and consult other older people.

*“If you could find somebody out of this younger senior generation to function as door openers or bridge builders to bring these technical possibilities closer to older senior generations. That is the main idea.”  
(EP 5)*

Those mentors could be door openers and act as mediators of new technologies because their life stage places them in a similar phase of life, which could prove to be more effective than if the assistance was provided by a much younger colleague. Thus, the strategic integration of personalised services can become a competitive advantage (Beuren et al., 2013). The research underlined that those services could lend support to strengthening the links of a practice and provide a means for social integration. As the expert workshop showed, very distinct forms of management behaviour (e.g., empathy) are embedded in those 'communal relationships' (Aggarwal, 2004), as compared to a more traditional ('exchange') relationship between producers and customers. Both types of relationship might be intertwined within a value proposition of a market offer (Aggarwal, 2004). To make it more clear, the author uses the distinctions of 'exchange relationships' and 'communal relationship' in the conceptual framework (Figure 44) to underscore that these different types of market strategies are guided by different 'norms of behaviour' (Aggarwal, 2004). Thus, requiring different marketing skills.

On a broader scale, it is necessary to consider which other practices “affect, enable, constrain, and interfere” (Nicolini, 2013, p. 230) with doing the laundry. Looking at the broader effects of a target practice by “zooming out” (Nicolini, 2013, p. 231) doing the laundry can be linked to dressing, which is closely implicated in the expression of identity (Twigg, 2014). As such, “clothes lie at the interface between the body and its social presentation” (Twigg, 2014, p. 78)

and embody a fundamental component of personality incorporating images of cleanliness (Kaufmann, 1998), freshness, and youth. Although fashion is usually associated with a younger life-style, “clothing can be used strategically to hide the stigma of the ageing body” (Day & Hitchings, 2011, p. 889). It appears, that using fashion to appear younger (Twigg, 2014) is a trend observed in the ageing segment to counter ageism. In a nutshell: for innovation management, the conceptual model suggests that innovation and product managers have to consider the entire complex of elements (including objects, skills, and images) of which practices are made (Shove, 2003; Shove et al., 2007) and the link to other related practices (“zooming out”) rather than considering technology use in isolation (Nicolini, 2013).

As this research has confirmed, various barriers (e. g., usage barriers, value barriers, risk barriers, tradition barriers, and image barriers) cause resistance to innovation (Laukkanen et al., 2007; Ram & Sheth, 1989) among older consumers. At a more strategic level, this research posits that different strategy types (service-oriented, technology-oriented, or a combination of both) need to be considered to address and overcome different types of barriers among older consumers. In this context, more ‘familiar,’ highly adaptable technologies (‘exchange relationships’) and new forms of service systems (‘communal relationships’), have potential implications for social life by achieving the ‘job to be done,’ thus ageing-in-place. The final conceptual model summarizes and incorporates the key elements from separate theories mentioned above. The qualitative research findings were used to gain understanding and to provide directional insights about ageing-in-place. As such, the model provides heuristic value in various ways. At a more conceptual, strategic level, the successful product and service development for the ageing consumer segment could be used by companies as a ‘springboard’ to enter larger consumer segments (Moore, 2002).

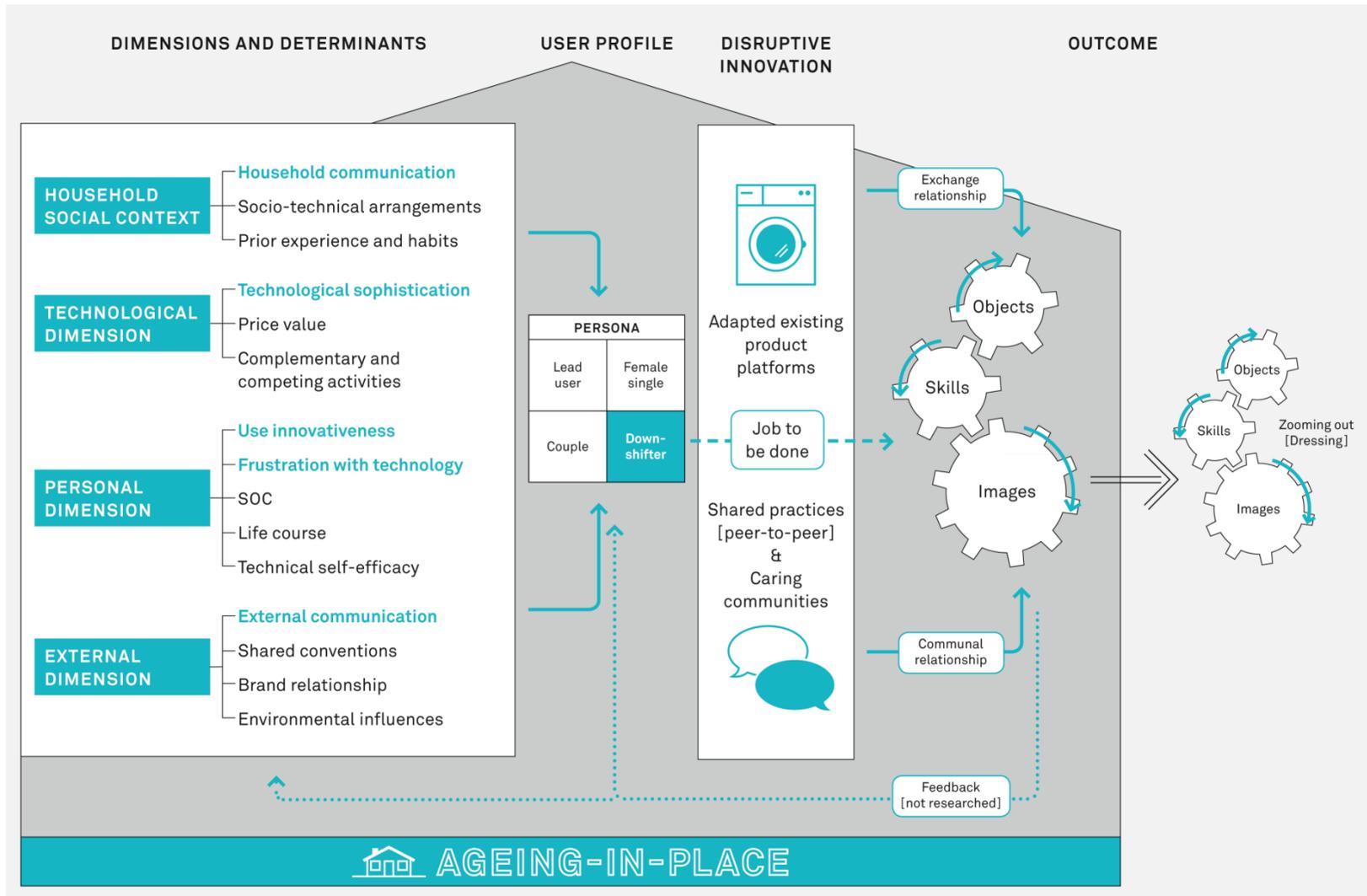


Figure 44: Final conceptual research model (based on Shih & Venkatesh, 2004 and Shove et al., 2012)

## 4.6 Chapter summary

In this chapter the results of the data collection methods: contextual interviews, participant observation, expert interviews, and focus groups sessions and the corresponding analyses were discussed and compared to the literature findings. The table below summarizes the main lessons learned.

**Table 46: Final expansion table**

Research Questions	Research method (primary data)	Research results
<b>How to identify and manage entrepreneurial opportunities for an ageing consumer goods market?</b>	<b>Following a multiple method qualitative approach. Combining attempts of 'applied ethnography', 'participant observation,' expert interviews, and focus groups.</b>	Basically, a new 'innovation' paradigm is required which shifts the attention from the individual to practices in which social life is embedded. The research suggests a new market segmentation approach to identify different user segments from which to derive more effective strategies. Further, the study indicates a dual innovation strategy that adapts from "existing product platforms" and considers concepts of sharing.
(1) How are independent living and the influence of household technology perceived by the elderly?	Contextual (home) interviews (incl. usage diaries). Expert interviews with day care workers.	The research confirms the wish of older adults for personal independence, however not as living in autonomy but in interdependence ('ageing-together'). Technological change notwithstanding, habits, routines, and conventions in daily practices have to be put forward for any active integration of new products or services. Participants were wary about new technologies being forced on them. To overcome resistance to innovations the research suggests solutions which are compatible with current routines.
(2) What are determinants that affect use patterns of household technology?	Contextual interviews (incl. diaries) and participant observation in the homes (incl. product demonstration and using cultural probes). Expert interviews to validate and enrich findings. Supplemented with focus group discussions of possible solutions. Presentation and joint discussion of user scenarios.	All four dimensions of the initial model could be validated and have been extended. Life course changes have the highest relative importance on rate of use. Use innovativeness is identified as key determinant affecting variety of technology use. The research confirms that different usage patterns among older adults result in different levels of interest in future technology acquisition. It identified the segment of 'downshifter' as the most appropriate segment for disruptive innovation. Basically, they prefer status quo solutions with a 'familiar' character.
(3) What are the implications for a company commercialising disruptive innovation targeted at the emerging segment of elderly customers?	Focus group with experts using scenario method to discuss conceptual directions and implications for a business model.	Managers need to be aware that different market strategies are required to overcome different types of innovation barriers among a highly diversified older consumer segment. They also need to consider that consumption and usage patterns of older adults are dynamic rather than static. To cope with this complex situation this research creates a market segmentation approach from which to derive more effective innovation strategies. It represents the foundation for matching the selected target market segment with the most efficient market strategy, which is either sustaining or disruptive innovation. In contrast to Christensen's theory, newcomers will likely not succeed in this segment as brand and customer loyalty favours established companies.

## 5 Conclusions

In the following, the author will highlight the key contributions regarding the overall research question: **How to identify and manage entrepreneurial opportunities for an ageing consumer goods market?**

### 5.1 Contribution to knowledge

Although a handful of highly influential models exist that are related to ageing, like the ADOPT model (Wang et al., 2011) or CREATE (Rogers & Fisk, 2010), it appears that “older persons do not get the technology they need, companies fail to tap into the opportunities of the emerging silver market” (Peine et al., 2015, p. 2). The author identified several shortcomings in all of the current cognitive approaches and behavioural models, like the TAM. Firstly, they are overly concerned with user needs (Peine et al., 2015) and those approaches neglect the habits, conventions, and structures in which daily life unfolds (Hargreaves, 2011). Secondly, they lack a more nuanced view of the segment diversity and neglect different use patterns. Finally, all models overlook the fact that older adults have to organize everyday life (Loe, 2015). Therefore, domestic practices play an important part because that is where the ‘embodiment’ takes place (Lai et al., 2008). Additional research (Herstatt et al., 2011; Kohlbacher & Hang, 2011; Kohlbacher et al., 2014; Levsen & Herstatt, 2011) explored the application of disruptive innovations targeted at elderly persons as an alternative approach to the predominance of empirical studies about the implementation of high-tech strategies. Those studies were qualitative in nature and employed multiple case analyses based on expert interviews, which resulted in limited insights of user level and everyday technologies (Loe, 2015). As a matter of fact, the triple win situation for older adults, policymakers, and entrepreneurs has remained disappointing (Mollenkopf et al., 2010; Neven, 2014; Peine et al., 2015). This thesis took a different perspective and explored the opportunities of disruptive innovation for and with older adults in the context of use. The entire study can be thought of as an attempt to address the methodological and theoretical lacuna of behavioural models of behaviour change which underpin free choice and consumer empowerment. In doing so,

the author looked beyond gathering ‘user needs’ from individuals and shifted to a practice-based lens that focussed on what older adults actually do in order to identify areas to facilitate ageing-in-place. In addition, that approach provides an alternative view to the dominant instrumental view (Peine et al., 2015) of ‘the more the better’ (Adner, 2002; Anthony et al., 2008; Christensen & Raynor, 2003).

### **A new integrated framework**

Alvesson and Sandberg (2011) noted that new contexts could result in important changes in theories. These new contexts and resultant changes could render originally theorized relationships obsolete, alter the importance of relationships, or create new relationships (Venkatesh et al., 2012). The work of Shih and Venkatesh (2004) provided an appropriate starting point because it emphasized different usage patterns, which was regarded as important to contextualize new concepts in daily practices. However, their model was applied to computer use and did not specifically relate to older adults and household appliances. The discussion of the empirical findings around determinants and usage patterns presented in this thesis builds on existing dialogues in various related academic disciplines, such as technology and innovation studies, social gerontology, and ageing studies. It leverages the context of the original model by Shih and Venkatesh (2004) to domestic practices and to what older people actually do, which includes a consideration of habits, routines, conventions and the ‘embodiment’ (Lai et al., 2008). The extension of that model led to a new conceptual framework (Figure 44).

Throughout the research, the author employed several concepts from sociology, mainly from a specific area called practice theory (Nicolini, 2013; Reckwitz, 2002; Schatzki et al., 2001; Warde 2005). Applying these concepts to the fields of innovation and technology studies and behaviour change is still rather uncommon. Although, it is not a completely new approach and various sociologists applied those concepts in innovation studies (Dourish, 2006; Hargreaves, 2011; Kimbell, 2009; Kuijer & DeJong, 2011; Pink 2004, 2012; Shove et al., 2012); it is a new application to the field of disruptive innovation. The author did not engage in an in-depth philosophical examination of their concepts that were primarily based on “habitus” from Bourdieu (1990), “actor network theory” by Latour (1997) and “technologies of self” by Foucault (1988).

Rather, the author made use of the skills, objects, and image framework by Shove et al. (2012) as a helpful tool to deconstruct doing the laundry as a path to understand elderly living realities. This approach was inspired by the sociologist Kaufmann (1998) and his work *Dirty Linen* and was adapted for this research, which is a unique analytical approach in the academia.

Despite that, the existing literature about technology acceptance and disruptive technologies does not fully emphasize the importance of practices in terms of independent living. In the reviewed literature, nothing was found that dealt with the theory of disruptive innovation as a means to facilitate domestic practices, thus ageing-in-place. The current literature does not include a model of technology acceptance that incorporates the elements of practice theory and disruptive innovation theory, which results in a new contribution from the current research. The primary findings underline that also the acceptance of household appliances must be “marketed strategically with different appeals to different segments” (Shih & Venkatesh, 2004, p. 70). The present topic is an important contribution to knowledge because no research was found that synthesizes the user typology of Shih and Venkatesh (2004) with the persona concept of Glende et al. (2010). By following this path, it was possible to create a novel market segmentation approach that respects the market diversity of the elderly segment. The study suggests that different usage patterns result in different levels of interest in future technology acquisition (Shih & Venkatesh, 2004). Thus, it was possible to identify ‘use innovativeness’ and ‘life course’ as key determinants affecting use patterns of older adults. The integrated framework incorporates the identification of different user patterns in order to provide more accurate user representations. From here, the development of new products and commercial activities can be derived that are much more user specific as opposed to general marketing approaches. The defined user segments help to identify specific types of disruptive innovations. Particularly, older adults from the ‘early technological generation of household revolution’ showed use patterns of limited use. Those older adults can be characterized for their voluntary less is more consumer behaviour. By focussing on this specific segment, which the author termed *downshifters*, it was possible to identify new areas of ‘low-end new market’ disruptive innovations, which relate to the concepts of collaborative consumption and to product service systems. That

approach goes beyond a pure technology orientation, which is a further contribution to knowledge.

### **Synthesizing theories from technology, sociology and innovation**

This thesis is expected to contribute to the body of knowledge as it synthesizes three fields of theory: Use Diffusion Theory (Shih & Venkatesh, 2004), Practice Theory (Reckwitz, 2002; Schatzki et al., 2001), and Disruptive Innovation (Anthony et al., 2008; Christensen, 1997, 2013; Christensen & Raynor, 2003; Raynor & Christensen, 2011), leading to a synthetic framework that enhances theory in all three fields:

- First, it broadens the field of application of the theory of Shih and Venkatesh (2004) by expanding it to domestic appliances and elderly users. In this way, it extends the original model by introducing aspects of habits, conventions, and structures. It complements the social constructivist approach by emphasizing context of use and therefore the “embodied perspective of consumers” (Lai et al., 2008, p. 381).
- Second, none of the empirical work about disruptive innovation dealt with the diversity of the ageing segment. As a result, designers and researchers have no clear understanding about the consumer profile that leads to ‘feature creep’ (Norman, 2010; Steen, 2008). In this research, the author transfers the usage patterns provided by the framework of Shih and Venkatesh (2004) into a description of fictive personas based on the primary findings from the contextual interviews. The usage typology was modified by applying personas, which provided a more realistic view of the diversity of this segment (see personas provided in Appendix 7).
- Third, based on consumer segmentation, the research contributes to and extends the theory of disruptive innovation because the segmentation provides a “diligent clarification of target customers” (Herstatt et al., 2011, p. 10). That contribution is unique as the literature does not make any specific distinctions of the consumer segments.

From a theoretical point of view, the findings are in line with the model of selection, optimization, and compensation (Baltes & Baltes, 1989; Freund & Baltes, 2002). It was possible to outline ways of adapting to life course by

selecting which of the involved activities to get ‘the job done’ are still necessary and which to neglect (e.g., ironing), to optimize their performance (e.g., by using more time) and to seek compensatory alternatives (e.g., help by a partner). The findings underline that changes in the life course (Elder, 1994, 1999; Loe, 2015; Mathur et al., 2007; Moschis et al., 1997) affect use patterns in a significant way and that consumer behaviour cannot be understood without understanding a person’s past product experience.

### **The practice turn in independent living**

In the literature, disruptive innovations applied to older adults were usually related to a deficit model of ageing (Kruse et al., 2012) with technology as a key enabling strategy to enhance the autonomy, independence, or freedom. An older woman put in her diary: *“For all the mentioned activities so much life time is wasted”* (P13, diary entry). This sentiment exemplifies that it is important to look at what people are doing (Nicolini, 2013; Warde, 2005) and to emphasize the contextual embodied situations that constrain behaviour and treat practices as the unit of analysis. However, as the research showed older adults were very wary about unfamiliar smart technology being forced on them. Paternalism in any form was a predominant concern of the elderly participants and was characterized in the following ways: as experienced in a day care centre, by the partner or by technology, in following cleaning conventions, or in mundane things like a wash programme. The only exception among the participants was an 80-year-old man who did not feel this constraint because he wants to be *“a free person.”*

*“I don’t have a mobile, I don’t need a mobile. Slaves need mobiles, this is what I always say. I am a free person.” (FP3, FG2)*

However, the author followed a research orientation that shifts away from user needs to practices and to ‘the job to be done’ (Christensen & Raynor, 2003). This shift invokes a major commonality of disruptive innovation theory and practice theory, which is an orientation to what people actual do and the accomplishment of a routine performance (Hargreaves, 2011) as part of normal life. This approach revealed that being independent is encapsulated in the structures of domestic tasks, daily habits, and conventions that are followed and solidified over decades. The practice turn in contemporary social theory

replaces individuals as a unit of analysis with practices (Nicolini, 2013; Reckwitz, 2002; Schatzki et al., 2001; Warde, 2005) and questions the liberal view of independent living and consumer empowerment. The author recommends the extension and application of this practice turn to other research areas like ageing-in-place and innovation management to provide a more realistic view on social life.

To recap, the current study showed that the context of household appliance use is a complex issue based on the effects of various dimensions such as the social context, the technology dimension, the personal dimension, and the external dimensions including their sub-determinants. This cannot be explained by individualist approaches like the TAM (Davis, 1989) or newer models alone and requires a consideration of habits, routines, and conventions as complementary explanations to facilitate domestic practices, thus ageing-in-place.

### **5.2 Contribution to practice**

This thesis is one of the few studies contributing to the intersection of innovation management, entrepreneurship, and ageing. The author wanted to use this study to raise awareness among academic scholars and practitioners of the challenges and opportunities that this intersection entails. This thesis exceeds the disciplinary boundaries of marketing and innovation management and explores the segment of the elderly from three angles: as users of technology, as future customers, and as individuals and practitioners of domestic tasks.

#### **The elderly: User, practitioner, customer**

This research confirms the findings of previous studies; innovation resistance seems to be a normal consumer response (Laukkanen et al., 2007; Ram & Sheth, 1989). However, this research found that the degree of resistance and the type of reasons differ significantly among older adults. Overall, this research confirms previous studies (Bagozzi, 2007; Ram & Sheth, 1989); potential changes from a satisfactory situation of current routines can cause resistance to the innovation.

Unsurprisingly, the main wish of older adults was to remain in their familiar environment for as long as possible. For this research, it was important to analyse the distribution of the products, their cohesion, and to understand how the laundry 'moves' through the home (Pink, 2004). *Dirty Linen* (Kaufmann, 1998) seems to have agency of its own and moves with the older adults through their home and even outside to the garden as they carry out different tasks. Applying this approach assisted with the identification of conceptual directions for solutions that facilitate domestic practices, thus independent living. By understanding the 'job to be done,' the author wanted to move away from the narrow approach of technology acceptance to a practice-based lens. This favoured a research method that follows the flow of the laundry and the practices and people involved. As mentioned in the beginning, using the washing machine and talking about doing the laundry was used as an analytical tool. Doing the laundry became a research tool that helped to understand the typical difficulties faced. The research observations confirm the literature (Pink, 2004, 2012; Shove 2003; Shove et al., 2012) that there are 'laundry routes' in the homes or 'invisible' paths and structures that everybody follows. Managers should be aware that their potential elderly target customers have a strong attachment to existing, familiar living arrangements. That information requires a reconsideration of autonomy-enabling innovations that acknowledges context of use. Thus, innovations seem to have a greater chance of acceptance when they are compatible with the current usage patterns. This would require an acknowledgement of the formative period and past experiences influencing current usage patterns and the consideration of existing mental models (Higgins & Glasgow, 2012). As a consequence, the innovation process needs to be directed to a product strategy that is derived from a familiar "existing product platform" (Herstatt et al., 2011, p. 1). Further, it is important to be aware of the disruptive changes in later life that result in a change modus in people's lives and different usage patterns. The results suggested that certain life events (e.g., widowhood) make daily routines more challenging, particularly for those living alone in large houses. The observations showed that the inability to conduct routine domestic tasks was a major concern for some elderly people. Therefore, it is important to acknowledge that use patterns are dynamic and must be addressed with more adaptable product concepts. Nevertheless, some participants were very skeptical about unfamiliar smart technology being forced

on them. Consequently, product managers are faced with a huge challenge. They are expected to simultaneously satisfy both the need for simple products and the desire for state-of-the-art technology. Moreover, the research confirmed that “it is advisable to be sensitive to the fact that community-dwelling older adults do not exclusively look at technology as a means to enable ageing-in-place” (Peek et al., 2014, p. 246). The primary findings underline that ageing-in-place is not so much a technical, but a social question. To put it briefly, “*to care for each other*” (P8) was a pervasive demand in all research phases.

High brand loyalty, which was expressed through the interviews, has far-reaching implications for businesses and the commercial aspect of applying disruptive innovations to the segment of elderly consumers. According to Christensen (2013), new, highly flexible companies are the main driver for introducing disruptive innovation in niche markets. However, the contextual interviews and the focus groups provided contradicting evidence for the elderly segment because of the high brand loyalty expressed by elderly users in comments such as “*I do buy brands*” (P8), “*...but mostly brand articles*” (P9), and “*I look more for brand articles. I have to rely on something*” (P11). Against this background, it becomes clearer how disruptive innovation is a business model problem (Christensen & Raynor, 2003). Unfamiliar newcomers would most likely be rejected or not be trusted by elderly consumers.

### **A new approach to market segmentation**

This thesis claims that broad strategies to address the ageing market without considering the market diversity are ineffective. Before developing marketing strategies, an understanding is required of the different living realities and the diversity of older adults. The ability to understand the diversity of the ageing population was one of the key undertakings of this research. This thesis addressed aspects of market segmentation that had not been thoroughly investigated in existing work about disruptive innovation. The existing body of related literature was found to be limited because it is primarily based on and targeted at the general population of older adults. This thesis followed a different kind of market segmentation. In their original model, Shih and Venkatesh (2004) followed a purely use and product-oriented approach by segmenting the market in relation to usage patterns, neglecting life-style

aspects. Conversely, in an alternative segmentation approach, studies used life stage segmentation and considered life course aspects (Mathur et al., 2005; Moschis et al., 1997), neglecting insights about daily usage behaviour. This research regards both aspects are directly related and suggests a combination of the two useful approaches, which provides a unique and important view of the market diversity. This research assumes that innovation acceptance has a greater chance when the product is perceived as consistent with existing usage patterns, which relates to Rogers' (2003) criterion of compatibility. Therefore, it is critical that older adults' usage patterns are thoroughly analysed. Having no specific user in mind leads designers and managers to "feature creep" (Norman, 2010; Steen, 2008), where all possible use scenarios are taken into account. The new segmentation approach has a two-fold goal. First, it provides an orientation about the capabilities and willingness of potential users to adopt certain products. This helps to identify potentially useless features for certain types of elderly users. Second, if useless specifications are identified and omitted, then household appliances become more affordable, which opens the way for disruptive innovations (Markides, 2006).

### **A business model approach**

The literature review emphasized that disruptive innovation suggests a new business unit (Anthony et al., 2008; Christensen & Raynor, 2003; Markides, 2006). The recommendation was to create an independent organization with a different value chain for disruptive innovation to ensure that it does not threaten the existing organization and vice versa. The author recommends a different approach when it comes to the ageing consumer segment, where both approaches can co-exist. In contrast, newcomers will likely fail as elderly customers generally maintain high brand loyalty, which favours established brands. As with disruptive innovation, the author suggests utilizing this brand loyalty in collaboration with a network of highly flexible start-ups. That represents a cultural and organizational challenge to an established company and should not be underestimated. It requires that managers adopt a "constructivist approach" (Alvarez & Barney, 2010) to entrepreneurship. It demands to focus not only on their current core business, but that they should allocate resources to build up the know-how and the culture with a different, unfamiliar kind of (niche) business. It also requires a general willingness to

accept experimentation and failure within defined limits (Chesbrough, 2010) and different marketing competence (Markides, 2006) with an interdisciplinary background and a management mind-set of participation and collaboration. Typically, managers view those emerging customer segments as financially unattractive with low profit margins and volume expectations (Govindarajan et al., 2011). Entering the ageing market is obviously not a straightforward matter and requires more than product strategy. In this line of thought, new product development requires a co-creation (Steen et al., 2014) of different stakeholders, including aspects of power and entrepreneurship, rather than simply a creative exercise or a “designerly approach” (Steen et al., 2014, p. 2). To sum up, this research suggests that established companies begin to consider new business models that are complemented by concepts of “collaborative consumption” (Belk, 2014; Botsman & Rogers, 2010; Matzler et al., 2015) which need to be combined with different forms of customer relationships (Aggarwal, 2004). Aligning an established company with a network of start-ups could offer new (niche) market insights; established companies can experiment with new innovations while focusing on current offerings (Charitou & Markides, 2003; Markides, 2006). However, a successful outcome might be due to the nature of innovation, which develops in unpredictable and nonlinear ways (Christiansen et al., 2013). As Chesbrough (2010, p. 362) put it: “Business model innovation is vital, yet very difficult ....”

### **5.3 Methodological contribution**

This thesis presented empirical research based on multiple methods of data collection and analysis. In the beginning, the author observed older adults’ conducting domestic tasks, in particular doing the laundry. As the home visits showed, simple activities like carrying the laundry basket down the cellar become challenging for some older adults. In a further research step, the author conducted several focus group discussions with older adults of possible future concepts and solutions. The discussions revealed, that older adults were very sceptical about multifunctional, smart technologies, and product functions being forced on them. They expressed a need for advanced but simpler appliances that have a ‘familiar’ character to them. As such the research belongs to the few innovation and technology studies that combine ‘applied ethnography’ (Steen,

2008) with the attempts of participatory design (Steen, 2008). By following the approach of engaged scholarship (van de Ven, 2007) it involves different stakeholder views (elderly, relatives, care givers, doctors, designers, managers) at different phases of the research. In 'applied ethnography,' researchers attempt to move towards the world of the user, e.g., through home visits. Conversely, in participatory design, users are invited to move towards the research process e.g., through workshops or focus groups (Steen, 2008). From the literature review of previous approaches, a distinction emerged between understanding current practices and exploring future practices. As such, existing research appears to address either one or the other. In this research the author has incorporated the two rather dichotomous methodological avenues. The author went to older adults' homes, observed domestic tasks, and listened to their narratives about their lives, domestic habits, and preferences in doing the laundry. Conducting 'applied ethnography' in the homes generated deep insights about the typical problems faced in doing rather simple tasks. Furthermore, throughout the research the author used elements of open innovation (Chesbrough, 2003) and participatory design like cultural probes and scenario techniques (Leonardi et al., 2008; Lew et al., 2015; Steen, 2008; Steen et al., 2014) to create 'openness' and stimulate discussions about alternative ways of doing a domestic practice. Furthermore, participant observation was used for triangulation of contextual interviews and to identify 'hidden needs' (Goffin et al., 2010). The author talked to experts like formal caregivers, doctors, and managers of care organizations. By 'understanding the job' (Christensen & Raynor, 2003; Goffin et al., 2012) the elderly are trying to get done, which is similar to an outcome-driven innovation process (Bettencourt & Ulwick, 2008), the approach widens the field of research and takes a practice-based lens. As the research uses a practice-based lens it departs from a pure user-centred research (Shove et al., 2007). Although implicitly embedded in Design Thinking approaches (Kimbell, 2012; Shove et al., 2007), it suggests a rather radical shift in innovation management research. This shift in ontology leads to a different way in which knowledge is generated; it requires that researchers move to the world of the participants (Steen, 2008).

### **Older consumers are embodied beings**

Consumer research has been “until recently epistemological disembodied” (Lai et al., 2008, p. 381). A practice-based approach emphasizes the physical burden or the embodiment (Reckwitz, 2002; Schatzki et al., 2001; Warde, 2005) as “the social is a field of embodied, materially interwoven practices” (Schatzki et al., 2001, p. 3). Doing research with a practice lens allowed the author to embrace a more embodied consumer perspective (Lai et al., 2008), as the “individual is the unique crossing point of bodily-mental activities ...” (Reckwitz, 2002, p. 256). By using participant observation and deconstructing the job to be done (Christensen et al., 2009) the author followed the ‘laundry path’ (Shove et al., 2012) through steep, narrow staircases into the cellar and into the garden where the dry laundry was hung and returned. Due to physical capabilities, tasks like ironing were rejected and work-arounds were commonly observed. Those ‘hidden needs’ (Goffin et al., 2010) provide starting points for future innovations. The author systematically used various stimulus material (e.g., ‘stained’ shirt) throughout the study as a trigger to activate memories and open up conversations. Further, the author conducted participant observation in a day care centre to triangulate data and to obtain a more complete and accurate understanding of independent living, daily activities, and the role technology may play. Focussing consumer research more on habits and conventions and the ‘embodiment’ (Lai et al., 2008) questions the liberal view of free choice that underpins independent living and consumer empowerment. It facilitates understanding what older adults are capable of and would help to better understand the challenges of ageing in one’s home.

### **Application to emerging markets**

To Yu and Hang (2010), the explicit identification of R&D strategies specific to the purposeful creation of disruptive technologies or products remained a research gap. The authors suggested that it remains unknown whether there is a systematic way to identify new disruptive opportunities for applying existing technology or products. Within a constructivist paradigm, the participatory and exploratory research practice used in this study is particularly recommended for unfamiliar and emerging customer segments, where deeper consumer insights are missing. A practice-orientation does not only imply gathering particular data in particular ways, it also has implications for the ways in which opportunities for

innovation are identified. In conclusion, the iterative research process, which includes participatory elements, is seen as a way to identify innovations that are based on the living realities of the elderly. To put it briefly, it attempts to close a pressing lacuna that one focus group participant called the “*generation problem*.”

*“The expectation of the industry is like that, they assume that everybody can do it or should do it and that is a generation problem.” (FP4, FG2)*

Finally, the main contributions to knowledge, practice and methodology are shown in Table 47 below.

**Table 47: Key contributions of thesis**

	Key contributions of thesis
<b>Knowledge</b>	The research has created a synthetic framework that melds and extends distinct conceptual elements from separate theories. The model directs the attention of innovation management to the accomplishment of social practices like domestic chores (‘job to be done’). The research confirms previous studies (Christensen & Raynor, 2003; Laukkanen et al., 2007; Ram & Sheth, 1989) that consumers have no a priori desire to “change jobs” (Christensen & Raynor, 2003, p. 93) because a new product is available. Rather, older consumers prefer solutions that are compatible with current habits and routines. However, certain life events (e.g., widowhood) cause changes in usage and consumption patterns (Mathur et al., 2005), which forge a path for new marketing concepts. Those concepts should offer solutions to facilitate domestic practices, thus independent living.
<b>Practice</b>	Managers need to be aware that different market strategies are required to overcome different types of innovation barriers among a highly diversified older consumer segment. They also need to consider that consumption and usage patterns of older adults are dynamic rather than static. To cope with this complex situation this research creates a market segmentation approach from which to derive more effective innovation strategies. It represents the foundation for matching the selected target market segment with the most efficient market strategy, which is either sustaining or disruptive innovation. Thus, it provides a systematic way to identify new disruptive opportunities. In addition, for some older adults the study suggests following a product service strategy that combines ‘familiar’ technology with additional, personalised services. This approach can be used as a springboard to enter larger consumer segments (Moore, 2002).
<b>Methodology</b>	The research has created a methodology that integrates multiple stakeholder views and combines an understanding of current domestic living situations with the evaluation of future product concepts. This approach is particularly recommended for unfamiliar and emerging consumer segments, where deeper insights are missing. Since most managers and designers are probably younger than the target group and do not share their life experience, the inclusion of ‘personas’ in the innovation process would be beneficial for the development of new concepts.

## 5.4 Limitations of present research

Bourdieu (1990) identified knowledge as constructed within practice rather than passively obtained. It would have been desirable to make a clear distinction between understanding the current practices of the elderly and envisioning alternative practices. However, during the interviews and focus groups sessions both aspects were usually mixed up. The approach required being open toward others and toward new ideas (Steen, 2008). The author chose a combination of ‘applied ethnography’ and participatory design. The applied data collection methods required a kind of openness from participants to talk about ageing, quality of life, and doing the laundry. However, most participants were unexperienced to talk about these issues. Some older adults had more difficulties with organizing the discourse and responded in a ‘telegraphic style.’ Cultural probes like a ‘stained shirt’ were used as a discourse trigger to structure the narratives in doing the laundry. In this joint inquiry, the elderly participants were actively involved in providing feedback about various user scenarios and the generation of solutions to facilitate independent living. For all participants, this was exciting, but also unfamiliar and even demanding (see table below).

**Table 48: Participant feedback (focus group with older adults)**

Participant Feedback (Moderator: "Finally, how was the session for you?")	<i>"Yes, this is our métier, basically." (FP7, FG1)</i>
	<i>"I have to say, the whole structure was marvelous. Well, I have to say, it was marvelous." (FP1, FG1)</i>
	<i>"Yes, I think we could imagine everything. Everybody could participate." (FP1,FG1)</i>
	<i>"Interesting and a bit exhausting, wasn't it?" (FP7, FG1)</i>
	<i>"I should have found it nice to give our points after each person, because, it is a bit too much for me. " (FP2, FG1)</i>

However, the presentation and discussion of personas and user scenarios has limits because most participants were not used and able to talk about future concepts; social desirability of comments cannot be neglected (Compagna & Kohlbacher, 2015). Most expressed difficulties in envisioning future ‘smart’

concepts (*"I can't image such a thing"*, FP1, FG2) because of their immersion in the current context of living. However, all agreed on the credibility of the described personas and expressed annoyance with unfamiliar technologies. Both can provide starting points for new developments. Obviously, older users' involvement is not the "panacea to the problems" (Peine et al., 2015, p. 3) and has its methodological limitations, but "examining an issue under multiple lenses can deepen both inquiry and understanding" (LeCompte & Schensul, 2010, p. 180). Those issues were addressed by using a multiple method approach, rather than by relying on user scenarios only. Qualitative research is a valuable tool for exploring social practices. However, the methodology has inherent limitations, including access to the field, small sample size and limited geography (Easterby-Smith et al., 2008; Hammersley & Atkinson, 2007; Maxwell, 2013). As such, the generated qualitative research findings have heuristic value and should be used to gain understanding about the complexity of influences on usage patterns and provide directional insights. The conceptual framework provides heuristic value for the application of disruptive innovations. Predictive results or causalities may be obtained through quantitative research. In the present dissertation, the determinants of household appliances use, particularly washing machines, were discovered, which limits the field of application. Here a replication of the study in the domain of cooking could provide interesting details about different factors affecting technology use. Applying disruptive innovation solutions to the practice of cooking with the aim to support health, thus independent living, seems to be a pressing gap that needs to be addressed. In addition, the chosen sampling strategy creates sample selection bias, as the participants for the contextual interviews were from the private network of the author and belong to the same social milieu

The software MAXQDA was helpful with organizing the analytical process, but like any other software, is 'reductionistic' and has limitations for an explorative study. The author paid attention to understanding 'background constructions,' which are explanations within an explanation to justify current attitudes or behaviour (Schütze, 2001). As these are difficult to code, the author made use of memos and sacrificed validity requirements. In doing so, the author had a chance to understand the deeper motivations for current attitudes and behaviour; this was important when talking to elderly persons about their

formative periods, sometimes over 60 years ago, which were times of financial hardship and resource scarcity.

### 5.5 Implications for future research

It appears that research “at the intersection of entrepreneurship, innovation management, and demographic change is still in its infancy” (Kohlbacher et al., 2014, p. 10). The study provides heuristic value and can be a starting point for a couple of future research studies mainly by shifting the research perspectives. The findings are seen as a means to foster an iterative process of learning. An ethnographic attempt was used because “ethnographies are portraits of diversity in an increasingly homogenous world” (van Maanen, 2010, p. 8), which was (at least partly) achieved with the current study. Due to time constraints, the author had to clarify the segments that were omitted and which lens to use to understand ageing and how to represent the elderly. This study began with contextual interviews and home visits to elderly persons from the ‘social milieu’ of the author. Focussing on that segment initially seemed to be a strong limitation because it provides a very narrow view on ageing. However, it occurred during the interviews that the problems and challenges of older adults in ‘spacious’ houses is a further neglected research area that needs a more focussed exploration. In remaining with the elderly’s perspective, one further possible direction for future research is to analyse the growing segment of elderly in their ‘Third Age’ taking care of their parents well into the ‘Fourth Age’ (Mollenkopf et al., 2010). As an example, an elderly woman reported taking care of her old parents: *“Then I retired in 1988 to nurse my parents, my mother was 101 years old when she died. My father 99 years.”* (FP4, FG1, today herself 80 years). Another possible direction for future research could be analysing the differences in usage patterns of household technologies between older adults with different cultural identity e.g., by including elderly immigrants living in Germany. A cross-cultural analysis of elderly immigrants living in Germany, sometimes for decades, could be helpful for getting a broader understanding of how ageing and technology is perceived by these sub-segments and of the factors affecting usage patterns. In fact, the perspective of ethnic minorities, such as elderly immigrants, is usually missing, and represents a rather large segment of the population in Germany (Mollenkopf et al., 2010).

Also the perspective of older adults who spend the majority of later life in mononational 'residential areas' abroad (e.g., at the Costa de Sol in Spain) or live in 'special residential areas (like Sun City in Florida) as alternative places to age, has gained little research attention (Simpson, 2013).

The data collection was based mainly on contextual interviews, expert interviews and focus groups with participants residing in Germany. The study may not be generalizable to other countries in the world, as the practice of doing the laundry might be perceived in a different manner due to cultural values, different cleaning conventions, and also mundane things like the location of appliance. Therefore, a replication of the research in form of a cross-cultural comparison could provide fruitful insight for companies as they usually distribute their appliances all over the world. Furthermore, the research did not distinguish technologies outside the domestic domain. Research that focussed on a comparison of practices and technologies in the public space could provide further insights: *"No, I have experienced that a hundred times at the ATM of our local bank that older adults as well as younger people can't really cope with that."* (FP5, FG2)-

This thesis recommends a further avenue for future research. There is no evidence that the observed usage patterns are causally linked to older adults as such. To the contrary, it may be assumed that the observed usage patterns are not limited to older adults, but may also occur in other consumer segments with similar conditions. As such, it appears that other market segments would also favour a 'good enough' product concept that is adapted from a familiar "existing product platform" (Herstatt et al., 2011, p. 10). In addition, the conceptual model indicates a feedback loop from the conduct of practices back to usage patterns and determinants. It is assumed that a successful or unsuccessful performance affects both areas, which was not researched in this thesis. Therefore, a number of opportunities for further research about disruptive innovation arise. In particular, the life course approach should receive additional scrutiny with regard to the influence of the formative period on technological use. Finally, an exploitation of household technologies upon which older people rely would not be complete without considering kitchen appliances. Exploring eating habits of older adults and applying disruptive innovations to the practice of cooking with

the aim to support health, thus ageing-in-place, seems to be a pressing lacuna that needs to be addressed.

Like other researchers (Christensen, 2013; Herstatt et al., 2011; Kohlbacher & Hang, 2011; Steen, 2013), the author adopted a social perspective on disruptive innovation because “disruptive innovation can have a key role in promoting positive social change, by empowering people to flourish and by promoting cooperation and creativity” (Steen, 2013, p. 27). As shown, inconspicuous everyday practices like doing the laundry are important research fields to understand social life and ageing. However, many companies follow a competition-driven, feature-oriented product development process. Too many times this leads to incremental innovations and a dilemma because “the design of everyday things is in great danger of becoming the design of superfluous, overloaded, unnecessary things” (Norman, 2013, p. 293). Already today, multifunctional smart household appliances are able to ‘communicate’ to each other. However, to facilitate ageing-in-place managers have to solve a pressing need because older adults wish simpler appliances that are ‘familiar’ to them and are at the same time more technological advanced. It is precisely this kind of smartness of household appliances that supports the domestic order. Finally, this links to an overarching question about the type and level of smartness of household appliances that should be addressed in future research (Edwards & Grinter, 2001). Whether these are referred to as disruptive innovations, or some other term is used is of secondary importance. It is more important that products are intuitive to use. Shove et al. (2007) put it briefly: “The world of the everyday is important” (p. 5). As it appears, technological changes notwithstanding, the habits, routines and structures in which daily activities unfold are permanent, making the product development process more challenging. But for the author, this is why a practice-based innovation approach can be so rewarding.

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## Appendices

### A1) Epilogue: Reflections on the field

My practice based innovation approach required a deep engagement in the field (Feldmann & Orlikowski, 2011). It required time for reflection throughout its iterative phases of evaluation and new knowledge creation. Time was essential to be able to apply the learning from each research learning cycle. This was not a straightforward matter. Easterby-Smith et al. (2008) stated that the relationship between the researcher and the researched can vary in at least two ways.

1. The researcher must be independent. That means the researcher is detached and stays neutral and remote from the research subject.
2. The researcher is part of what is being observed.

It is tempting to see the two approaches, especially positivism and social constructivism as incommensurate to each other. However, the research journey entailed a couple of intermediate stations and detours as I had to shift my role from manager to independent researcher. In analogy to the diagram of Steen (2008), I can plot my research process in a diagram with two axes: a horizontal axis that plots positivist versus social constructionist approaches; and a vertical axis that plots detached versus involved researcher's roles (see figure below, extended from Steen, 2008).

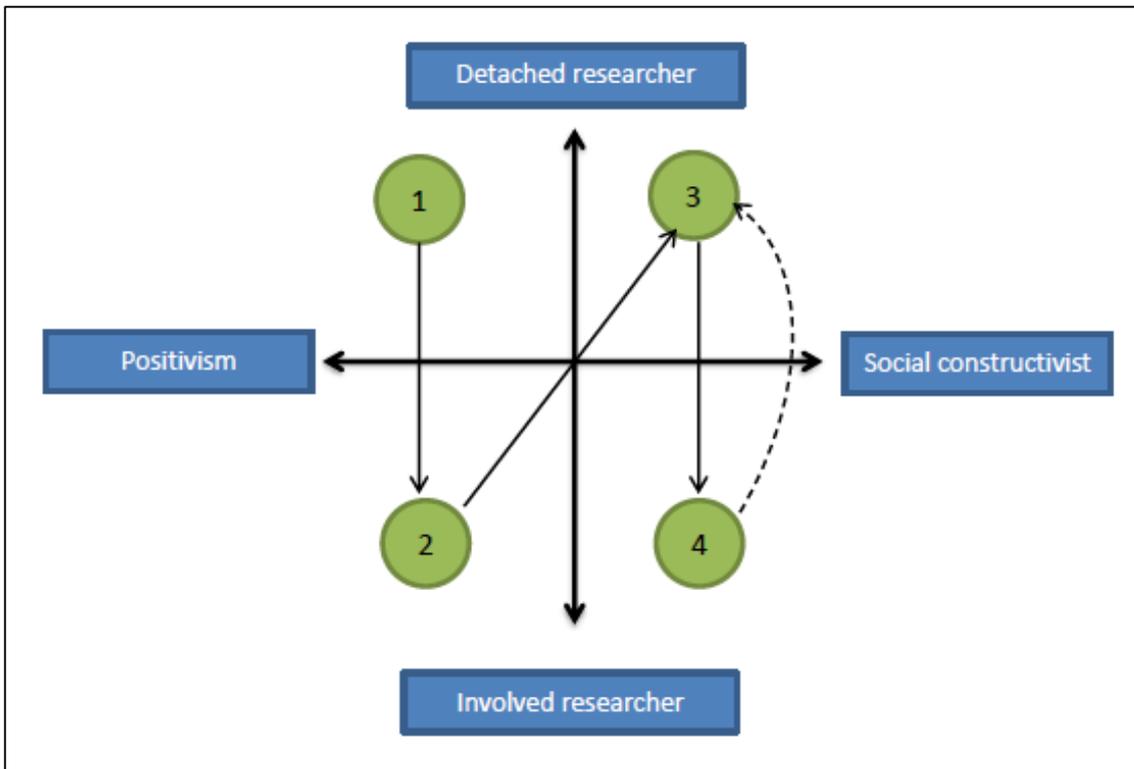


Figure 45: My research journey (adapted from Steen, 2008)

### Position 1

Typically, product managers have a rather action-oriented approach in order to drive the business of their product category (see figure above, position 1). They see quantitative methods like surveys as a method through which ‘mainstream’ consumer ‘needs’ could be obtained and product development decisions could be based (Goffin & Mitchell, 2010). As such, they have a rather detached role.

### Position 2

Typically further research is done like usability studies with prototypes, where the user feedback is analysed and the involvement grows (position 2), but still in a rather reductionist manner. Usually, it includes consulting external agencies to conduct focus groups, etc. instead of getting really directly involved by talking with each other face-to-face (Goffin & Mitchell, 2010). Obviously, there seems to be a social gap between ‘them’ (older customers) and ‘me’ (manager). In accordance with Chesbrough (2003) I have termed that approach “The Closed Innovation Paradigm” (p. 21) because managers stick to their traditional research heritage.

**Position 3**

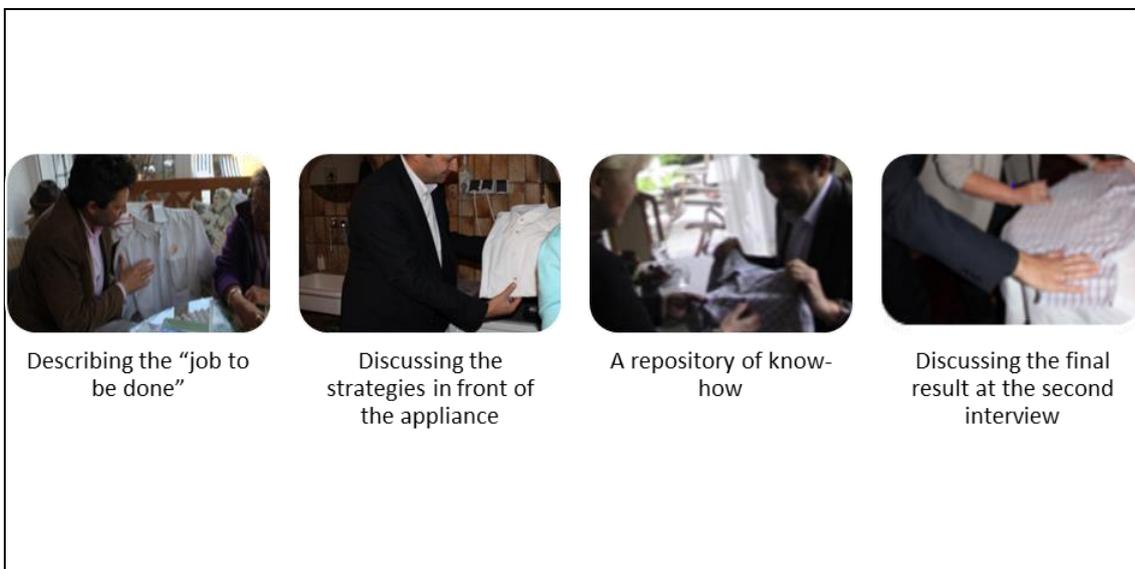
During the doctoral research journey one of the first major discoveries was that the bulk of published academic research on disruptive innovation was rooted in case studies. However, to conduct a 'case study' *about* older adults seemed to be not adequate for my research question, while in the "swampy terrain" (Schön, 1983) of social constructivism lies the path to explore the situation of the elderly. In an auto-ethnographic mode I realized that my 80-year-old father never uses his rather expensive car navigation system and in contrast my 69-year-old mother-in-law is able to 'skype', a rather popular disruptive innovation, with my six-year-old daughter from her holiday destinations. I wanted to understand why. To Steen (2007), "in STS, a typical research would study the practices of (a group of) people who play a role in creating using some technology, and would be done via (participant) observation and interviews, like an ethnography" (p. 4).

Such research would be done within a social constructionist paradigm, based on the idea that 'reality' is constructed by people rather than by objective or external factors (Easterby-Smith et al., 2008; Steen, 2007). And it would require a researcher who goes 'into the field' and studies the older adults. Some scholars (e.g., van Maanen, 2010), with whom I was able to talk directly on a conference, doubt that somebody can do 'ethnography' without 'going native' in the traditional way. I respect that, and called the approach 'applied ethnography' (Steen, 2008) to make a distinction. As such, it was required to go out of the ivory tower of my home office. I conducted the first home visits to elderly people to observe the way laundry is done (position 3) and to understand the typical problems they face. The general responses were in principle like that: *"I don't need all these new smart household appliances anymore. We have the best days behind us. Anyway doing the laundry is not a problem for me. Let's go to the cellar, I show you how I do the laundry, maybe there are some interesting observations for you to make about my daily routines"* or comments like that.

I was intrigued by the book *Dirty Linen* from sociologist Kaufmann (1998) who talked with couples about 'doing the laundry' to understand the relationship. I adapted that approach, 'doing the laundry' for me was an analytical tool to understand the living situation, the challenges and capabilities to do domestic practices in later life. It was especially helpful to conduct the interviews with

older couples or the older participant together with the daughter or son. They would complement or contradict each other, thus providing a richer narrative. It was challenging to uncover underlying rationales and common understandings about domestic practices of the older adults. Because it was obvious that these rationales include judging if something is adequate, clean and proper. Impression management and the presentation of oneself (Goffman, 1959) obviously played a role in some cases.

I gained access over contacting persons from my private network. As a consequence these persons present my social milieu, insofar I obtain a certain, narrow view of the heterogeneity of this segment. Nevertheless, the snowball sampling through my private network provided a kind of user insight which would have been difficult to receive otherwise. Furthermore, the domestic setting makes observing performances without influencing the activity very difficult. Obviously, giving accounts of mundane, routine practices, is not easy for participants because this is something they are not used to do. To create ‘openness’ I used cultural probes like a shirt with stains, to stimulate narratives.



**Figure 46: Impressions from contextual interviews**

Doing “fieldwork at forty” (van Maanen, 2010, p. 9), like I engaged in, makes an open, ‘clueless, naïve’ attitude even more challenging. It appears that cultural oversights, misunderstandings, embarrassments, and ineptitudes are common in fieldwork (van Maanen, 2010). However, doing “fieldwork at forty” has helped me to be more sensitive toward the elderly. Relationships based on a certain

form of rapport can only grow with time, patience, and luck (van Maanen, 2010); I was lucky.

This study considered elderly participants that are still able to live independently at home without external help. For ethical reasons, older adults with major physical limitations that require assistance by day care workers were not considered in this study. They might have different requirements and perceptions of household technologies. This would relate to gerontechnologies which usually focus on assistive and medical technologies as aged-based innovations for older adults (Herstatt et al., 2011; Kohlbacher et al., 2011; Loe, 2015). Ethnographers usually follow the intention to enter strange places with the intention of making them familiar, which appears to be romantic and adventurous from the outside (van Maanen, 2010). I tried to familiarize myself with the 'unknown' by doing multi-site research. After the home interviews, a day care centre was visited for participant observation without conducting any interviews with inhabitants for ethical reasons. So, their viewpoints were not heard. The primary method employed was 'applied ethnography' with short field visits. Miller (2010) identified the home as a key site for research in the contemporary context in which we live because "in the industrial societies, most of what matters to people is happening behind closed doors of the private sphere" (p. 1). However, traditional ethnographers challenge the approach by fieldworkers who make comparatively short visits to the field and make tightly focused interpretations (van Maanen, 2010). That method has been criticized as a way of meeting the demands of contemporary academic careers and studying a relatively 'thin culture.' However, there are different views around what is to be considered an adequate field experience (Millen, 2000; Steen, 2008). From my point of view, the more targeted or limited the ethnographic attempt is to a particular and well-defined cultural problem, the less time in the field is thought necessary.

### **New experiences**

Concerning fieldwork, I occasionally struggled with the aim "to maintain a more or less marginal position" (Hammersley & Atkinson, 2007, p. 88). "Managing the marginality" (Hammersley & Atkinson, 2007, p. 86) was particularly difficult at times when emotions were overwhelming, for example while talking to day care workers, which was a new experience for me. Here memos provided relief of

inner discussions and conflicts and a way to reflect about feelings during new encounters. When I entered, for the first time in my life, a day care centre, my role changed to ‘participant observation.’ The first thing I noticed was a bus stop which was close to the entry door. I was told that this is an orientation help for older adults with cognitive problems.



**Figure 47: Bus stop in front of the care centre**

Schön (2001) argued that a vital attribute of all effective practitioners is that they are able to reflect on their on-going experience and defined reflection-in-action as “[...] a kind of on-the-spot-inquiry” (p. 11) and: “[...] the practitioner allows himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique.” (Schön, 1983, p. 63) Also in this situation writing memos was a helpful means.

### **Position 4**

Although I felt confident with staying in the social constructionist paradigm, I was not satisfied with just understanding ‘typical problems’ in conducting domestic chores. I supplemented my approach with focus group discussions. I wanted to jointly envision and create future concepts and living arrangements, technical and non-technical. I changed my role to a ‘moderator’ and used participatory methods and included various storyboards as a stimulus material (see picture below). I read aloud about fictive use cases (position 4) which obviously were enjoyed by the participant.



**Figure 48: Discussion of user scenarios in focus groups**

Talking about future concepts can be an advantage that the researcher is an ‘insider’ to the topic, because people are more likely to reveal information when similar experiences are shared. However, there is a thin line between being a moderator exploring future concepts and being regarded as paternalistic, pretending to know what seems to be best for the elderly (Steen, 2008). Overall the researcher’s position should be detached (Steen, 2008). However, as the research questions and the methodology involved different methods, I occupied different roles depending on the research question and appropriate research method to be done (Steen, 2008). There was an observer role for analysing the product demonstration in the homes, while in the participatory elements of the focus groups, the level of involvement as ‘moderator’ was higher.

For my approach, it was substantial to understand the multidimensional and multidirectional character of ageing and the role technology can play. Finally, it added up to ‘thick description,’ derived from various stakeholder perspectives. For me, thick description means to search for the meaning of a practice or action, otherwise the search for a meaning would remain rather superficial - thin description. After one year of field study and three research stages the following qualitative raw data had been generated:

- Twenty-one document transcripts of the home interviews including usage diaries, field notes, photos, and videos of product demonstrations about doing the laundry
- Six document transcripts of the expert interviews and field notes
- Memos and a protocol of the expert interviews with day care workers

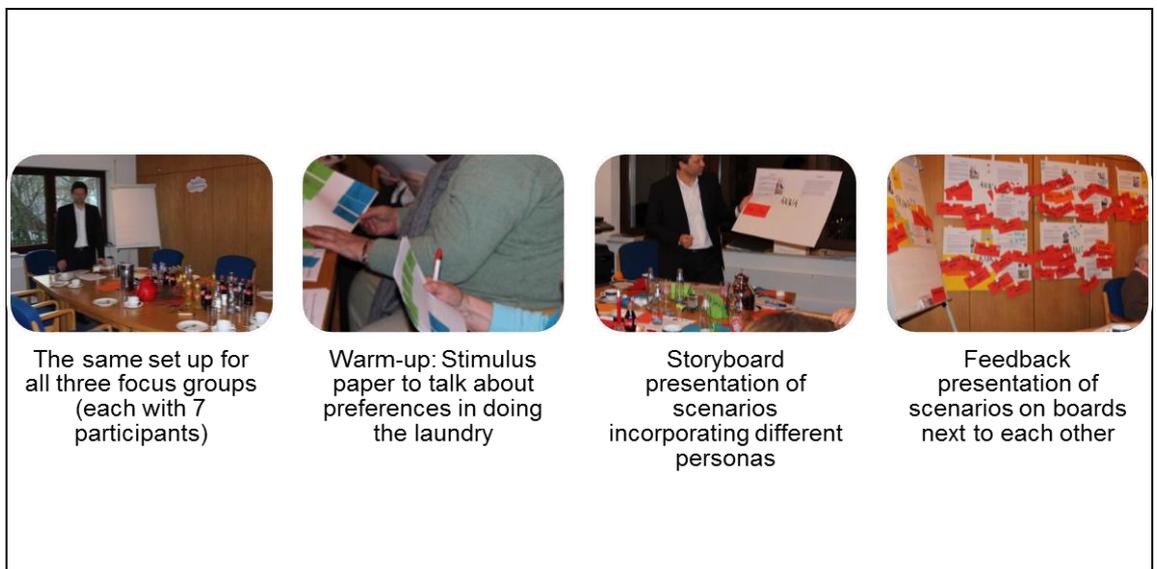
- Three document transcripts of focus groups with elderly, including field notes and photos
- One document transcript of focus group with experts, including field notes and photos

Future researchers interested in adopting an ethnographic approach need to be aware that gaining access and permission was not always easy. Inviting and involving family members was helpful. Not only does it increase the acceptance, it allows an observation of interaction and how the decision process is influenced and “which compromises are reached” (Goffin et al., 2012, p. 52). Occasionally interesting debates arise and create tension. Humour can help out in this matter. Long after the field study was completed, a considerable length of time was required for reflection. That was when the real learning began.

**Impressions from the field**



**Figure 49: Participant observation during home visits**



**Figure 50: Focus group set up**

## A2) Checklist (CASP, Critical Appraisal Skills Programme, 2014)

Table 49: Checklist for article evaluation

Critical appraisal skills programme (CASP)		
Criteria	Questions	To consider(exemplary)
Screening question	Was there a clear statement of the aims of the research?	<ul style="list-style-type: none"> <li>• What the goal of the research was?</li> <li>• Why is it important?</li> <li>• Its relevance</li> </ul>
Screening question	Is a qualitative method appropriate?	<ul style="list-style-type: none"> <li>• If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants</li> </ul>
Appropriate research design	Was the research design appropriate to address the aims of the research?	<ul style="list-style-type: none"> <li>• If the researcher has justified the research design</li> </ul>
Sampling	Was the recruitment strategy appropriate to the aim of the research?	<ul style="list-style-type: none"> <li>• If the researcher has explained how the participants were selected</li> <li>• If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study</li> <li>• If there are any discussions around recruitment</li> </ul>
Data collection	Were the data collected in a way that addressed the research issue?	<ul style="list-style-type: none"> <li>• If the setting of data collection was justified</li> <li>• If it is clear how data were collected</li> <li>• If the researcher has justified the methods chosen</li> </ul>
Reflexivity	Has the relationship between researcher and participants been adequately considered?	<ul style="list-style-type: none"> <li>• If the researcher critically examined their own role, potential bias and influence on</li> </ul>
Ethical issues	Have ethical considerations been taken into account?	<ul style="list-style-type: none"> <li>• If approval has been sought from the ethics committee</li> <li>• If the researcher has discussed issues raised by the study</li> </ul>
Data analysis	Was the data analysis sufficiently rigorous?	<ul style="list-style-type: none"> <li>• If there is an in-depth description of the analysis process</li> <li>• If systematic analysis is used. If so, is it clear how the categories/themes were derived from the data?</li> <li>• If sufficient data are presented to support the findings</li> </ul>
Findings	Is there a clear statement of findings?	<ul style="list-style-type: none"> <li>• If the findings are explicit</li> <li>• If there is adequate discussion of the evidence</li> <li>• If the findings are discussed in relation to the original research questions</li> </ul>
Value of research	How valuable is the research?	<ul style="list-style-type: none"> <li>• If the researcher discusses the contribution to knowledge</li> <li>• If the identify new areas where research is necessary</li> </ul>

### A3) Article selection

Table 50: Article selection (table adapted from Peek et al., 2014)

Article	Technologies and innovations studied			Theory Used		Market diffusion		Research Scope				CASP Criteria?	
	First author [year]	(I) ADL	Smart Home/AAL/ICT	Robot	Yes	No	Pre	Post	Type/ Age range	Instrument/Methods	N	Key determinant/constructs discussed	Yes/ partly/no
Alaoui (2014)	...	X	...	...	X	X	...	...	Qualitative >65 years	Living lab approach (Smart TV), interviews, use personas	50	Social engagement, acceptance, adoption, socio-technical approach	2/7/1
Bailey (2009)	X	...	...	...	X	...	...	X	Qualitative n.a.	Ethnographic study, contextual interviews and participant observation	57	Life course	3/5/2
Balasch (2014)	...	X	...	...	X	X	...	...	Qualitative	Ethnographic study (installation of telecare system), contextual interviews and observations	12	Usability, accessibility, value (emergency help, social contacts, social support), privacy	5/3/2
Blythe (2005)	-	X	...	...	X	X	...	...	Qualitative n.a.	Ethnographic study, contextual interviews and observations	2 (4)	Social context of use, the need for sociability, access for all	3/5/2
Coughlin (2007)	...	X	...	...	X	X	...	...	Qualitative >40 years	Workshop and focus group with experts	30	Technology design (usability, reliability functionality, ethical considerations, user perception (stigma), access of technology, equity and affordability)	4/6/0
Demiris (2004)	...	X	...	X (DOI)	...	X	...	...	Qualitative >65 years	Focus groups	15	Usability, training, independence, value (emergency help, security, safety), human respondents, privacy	3/4/3
Ehrenhard (2014)	...	X	...	X	...	...	...	X	Qualitative	Case study of Smart Home with stakeholder interviews	14	Perceived value, unfamiliarity with technology, fear of losing control, privacy, costs	6/3/1
Fink (2009)	X	...	...	X (TAM)	...	...	...	...	Qualitative various ages	Ethnographic study (diaries and one-site observations)	9	Usefulness, ease of use, curiosity, habits, beliefs, context/environment, perceived value, social compatibility, norms, financial benefits	5/3/2

APPENDICES

Article	Technologies and innovation studied			Theory Used		Market diffusion		Research Scope				CASP Criteria?	
	First author [year]	(I) ADL	Smart Home/ AAL/ICT	Robot	Yes	No	Pre	Post	Type/ Age range	Instrument/Methods	N	Key determinants/constructs discussed	Yes/ partly/no
Friesdorf (2007)	X	X	...	...	X	...	...	X	Mixed methods > 55 years	Survey and contextual (home) interviews (incl. user workshops)	60	Usability, acceptance, living situation and biographic experience, SOC	8/2/0
Gomez (2015)	...	X	...	...	X	...	...	...	Qualitative > 65 years.	Ethnographic study (installation of tele care system), contextual interviews and observation	12	Autonomy-enabling innovations, living arrangements, socio-technical arrangements	5/3/2
Heinz (2013)	...	X	....	X (DOI)	...	...	....	...	Qualitative > 60 years	Focus groups	30	Usability, frustration, limitations, transportation, help and assistance, self-monitoring, gaming	4/5/1
Herstatt (2011)	X	X	X	X (DI)	...	...	...	...	Qualitative	Multi case analysis 'companies' from different industries (expert interviews)	4	Individual autonomy, usability (independent), mobility, freedom of choice, social participation	7/2/1
Jakobs (2008)	X	...	...	X (TAM)	...	...	...	X	Mixed methods. > 55 years	Survey and contextual (home) interviews	48	Technology support for self-determined living, skills, usability, interest, accessibility	7/1/2
Kohlbacher (2011)	X	X	X	X (DI)	...	...	...	X	Qualitative	Multi case analysis various products (expert interviews)	4.	Usability, value (good enough performance, affordability)	7/2/1
Kohlbacher (2015)	X	X	X	X (DI)	...	...	...	X	Qualitative	Multi case analysis various companies (expert interviews)	6	Opportunity recognition, opportunity exploitation, autonomy-enhancing	5/4/1
Tinker (2004)	...	X	...	....	X	...	...	X	Qualitative > 70 years	Ethnographic study, contextual interviews	67.	Home adoption/modification, type of living environment, costs of adoption	6/2/2

APPENDICES

Article	Technologies and innovation studied			Theory Used		Market diffusion		Research Scope				CASP Criteria?	
	First author [year]	(I) ADL	Smart Home/ AAL/ICT	Robot	Yes	No	Pre	Post	Type/ Age range	Instrument/Method	N	Key determinants/constructs discussed	Yes/ partly/no
Levsen (2015)	X	X	X	X (DI)	X	...		X	Qualitative	Multiple case study 'lead markets' (expert interviews) Stair lifts, etc.	4	Aged- based innovations, lead markets)	5/3/2
Loe (2015)	X	...	...	...	X	...		X	Qualitative > 85 years	Ethnographic study, contextual interviews and participant observation	30.	Life course, autonomy, paternalism, context of use, self-determination, self- care	7/1/2
Maguire (2011)	...	X	...	...	X	...		X	Mixed methods > 60 years	Ethnographic study, contextual interviews	40	Coping strategies, kitchen ergonomics, dexterity, hearing, reaching and stretching, sight	4/2/4
McCreadie (2005)		X	...	X	...	...		X	Qualitative > 70 years	Ethnographic study, contextual interviews	67	Acceptability, felt need and product quality, housing type	6(2/2)
Mitzner (2010)	X	...	...	X (TAM)	...	...		X	Qualitative > 65 years	Focus groups	113	Technology supporting activities, convenience, security and reliability of technology, experience,	8/1/1
Mollenkopf (2010)	...	X	...	...	X	...		X	Mixed methods	Questionnaires, face to face and telephone interviews with experts	n.a	Real life suitability, user friendliness, reliability, lack of information, skills, reluctance, financial resources	8/2/0
Monk (2008)	X	...	...	...	X	...		X	Qualitative	Semi-naturalistic usability studies	n.a.	Usability, social enjoyment, ethics (privacy), design (tastes and values)	4/4/2
Neven (2010)	...	...	X	X	...	X		...	Qualitative > 65 years	Interviews with experts (researchers)	6.	User representation, imagined user, scripts	4/3/4

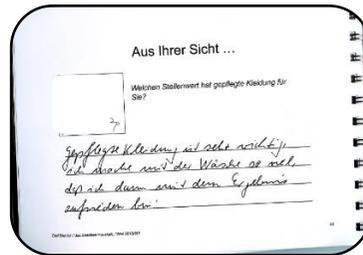
APPENDICES

Article	Technologies and innovations studied			Theory Used		Market diffusion		Research Scope				CASP Criteria?
	First author [year]	(I) ADL	Smart Home/ AAL/ICT	Robot	Yes	No	Pre	Post	Type/ Age range	Instrument/Method	N	Key determinants/constructs discussed
Neven (2014)	...	X	....	X	...	x	...	Qualitative	In-depth interviews	5	User representation. Age scripts, paternalism	4/2/4
Peine (2014)	....	X	....	X	...	x	...	Qualitative	Use previous studies e.g., related to assistive technology (Neven)	n.a.	Co-creation of technology, diversity, user representation, active consumption, configurational work	4/1/5
Renaud (2008)	...	X	...	X (TAM)	...	...	X	Qualitative > 60 years	Interviews including activity scenarios related to mobile phone usage	34	User context, perceived usefulness, intention to use, experimentation and exploration, ease of learning and use, confirmed usefulness, actual use	7/1/2
Sims (2012)	X	...	...	...	X	...	...	Qualitative > 60 years	Ethnographic study, contextual home interviews (two interviews)	48	Kitchen ergonomics, layout, coping strategies, independence	6/3/1
Suopajarvi (2014)	...	X	...	...	X	...	X	Qualitative > 60 years	Ethnographic study, contextual home interviews	16	Past experiences influence technology use	6/3/1
Van Hoof (2011)	...	X	...	...	X	X	X	Qualitative > 64 years	Ethnographic study, contextual home interviews	18	Safety and security, help to postpone residential care, usability and design of technology, functionality, environmental interventions	8/2/0
Wu (2012)	...	...	X	...	X	X	...	Qualitative > 65 years	Three focus groups Using pictures of robots	15	Appearance and acceptance of social robots, human traits, social context of elderly, user participation	3/3/4

## A4) Usage diaries (examples)



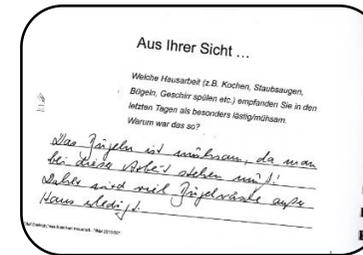
User booklet:  
self-reported weekly  
laundry activities



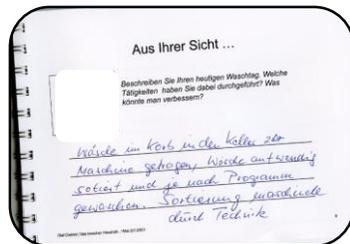
"How important is neat  
clothing for you?"



"How do you dry?"



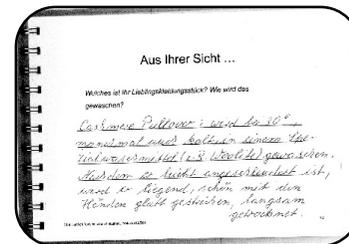
"What is tiring?"



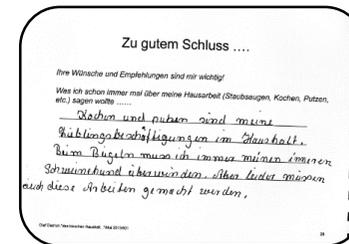
Today's laundry  
activities: "Describe  
your steps taken"



"Where is the  
machine located?"  
(height increased  
washing machine in  
the cellar)



"How do you wash  
your favorite  
clothes?"



Finally.....: "Your  
recommendations"

## A5) Contextual interviews: Profile matrix

Table 51: Profile matrix

IP	Independent Living	UD Determinants			
		Household social context	Technological dimension	Personal dimension	External dimension
P1	<p>“So I do not feel as old as I am at all, you know? I guess I am still around 60 years, you see.”</p> <p>“Security is social security, the pension and so on and then the freedom which you didn’t have in your working life. That you get up in the morning and tell yourself: Let’s call it a day! So that you can arrange your day for yourself. No work pressure anymore. So that you can really enjoy it.”</p> <p>“You see, I am not as fit as in earlier days.”</p>	<p>“Well, every staircase is dangerous.”</p> <p>“I think to simplify... this short way of the laundry to the washing machine, right? In such a house – especially, when there are different floors,…”</p> <p>“But the first washing machine I got was in 1967. ... There I actually got to know a lot from my mother-in-law.”</p>	<p>“The programmes are the decisive ones. “</p> <p>“It is nearly made for idiots,... each programme can be chosen individually by a button.”</p> <p>“I prefer household devices with very little energy consumption, even if the runtimes of the programmes are longer.”</p> <p>“Exhausting, it is really exhausting. To iron 10 shirts. In a row.”</p>	<p>“One is not much into technology, the other one is...- but I have always been, even as a child“</p> <p>“Especially at an older age, it is like that. You forget a lot, that you quickly forget a lot.”</p>	<p>“Actually I would prefer the tests.”</p> <p>“There is somehow something positive about it, when you smell the free nature, in your bed...”</p> <p>“This is probably our generation, we have been lied to so often.“</p> <p>“Because they build the devices in that way that they do not have a shelf-life and cannot be repaired.”</p>
P2	<p>“Health is the most important thing. Well – then social contacts, to have good friends – right. And to have above all more time...”</p> <p>“... this is what I want to continue. As long as I can...”</p> <p>“It should be modern, stylish, shouldn’t it? You just have another charisma“</p>	<p>“My husband didn’t want to, right? Oh, there we had a lot of trouble. For heaven sake.”</p> <p>“I want to have it in the cellar... Most of all because I have the dryer next to it and in the next room, I can hang up the laundry.”</p> <p>“Well, the first washing machine I got was when we got married. In 1965.”</p>	<p>“One thing which would make me sceptical is: if a machine is built in such a way that I could only use these certain capsules. Because then I am dependent on the producer of these capsules.”</p> <p>“I am not the youngest anymore, but older people can’t really cope with that anymore.”</p> <p>“...especially the economy programme has a short wash, if you have just clothes which are only lightly sweaty, ... then they are fresh again, aren’t they?”</p> <p>“But I think I wouldn’t buy such a cheap one. I think it can’t be of a high quality, can it?”</p>	<p>“...a crisp, fresh look“</p> <p>“It is really a changeover. At first I bought much too much.”</p> <p>“You have to change. It is like that.“</p> <p>“That’s the age, isn’t it? You have different interests that you go out for a coffee with a friend in the afternoon.”</p> <p>“I have some pullovers made of cashmere, well, I wash them, and they come out of the machine, 100 percent.”</p>	<p>“And it is really great to dry outside, in the sun, and what is best, if it is windy, it gets quite smooth.”</p> <p>“And then I put it into the washing machine. I washed it as usual with a, a washing detergent, with a gel, an intensive gel, this is what it is called, if, if it is extremely dirty. Yes and then out again and then I dried it, no, it wasn’t gone and then I laid it outside into the sun onto a bush and I always sprayed water onto it.”</p>

IP	Independent Living	UD Determinants			
		Household social context	Technological dimension	Personal dimension	External dimension
P3	<p>“And if I can’t do that anymore, I will have to go into a home for the aged, you see? Yes, if it doesn’t work anymore. Then I don’t need that anymore.”</p> <p>“But in the afternoon, I don’t do anything in my household.”</p> <p>“No, then – I like to run around and do a lot, we do a lot – and if my knees hurt because of my bike tours, every evening. But, you see, there is nothing better.”</p>	<p>“I have a lot and I wash that by hand. They always laugh at me, right?”</p> <p>“Well, you see, my husband turns 80, doesn’t he? I would buy such a machine again, I would, I would – as I say – I would give the extra money to my grandchildren. I don’t buy any new devices.”</p> <p>“I do the laundry once a week. Every Monday or Tuesday, more – that is enough...”</p>	<p>“It washes as it should, doesn’t it? It doesn’t stop or rumble.”</p> <p>“Well, you see, these few years we still have in front of us. It doesn’t have to last 30 years anymore.”</p> <p>“I would buy the same again, we could cope with this one very well.”</p>	<p>“Gosh! We have everything behind us, all these years, you see? So I don’t get myself such a thing.”</p> <p>“No, I don’t have something like that, I stick to my old things.”</p> <p>“I don’t get really dirty, because I just go for a walk.”</p> <p>„I don’t have any ideas for something new.“</p>	
P4	<p>“WHAT KIND OF AN AGE DO WE HAVE? WHAT ABOUT 70? That’s nothing. I want to go to Side for the next ten years.”</p> <p>“The garden and this big house, I couldn’t cope with that alone. With everything connected to it. No. That would not be- not be possible for me.”</p> <p>“I love this house.”</p> <p>“... to be free – to spend my money. I don’t want to be dependent on somebody.”</p>	<p>“Yes, I want to do everything. He has to explain the things to me I can’t do. Then I do it.”</p> <p>“...and then I would take G. with me, so that he also knew about it. Because, if I come home, I probably can’t do it anymore.”</p>	<p>“A high spin rotation is important to me. That I can take the laundry out and it is already quite dry.”</p> <p>“That I have a time programme, where I can dry the laundry in a short time. Where I can choose the temperature well... And maybe an economy cycle that doesn’t waste that much water.”</p>	<p>“Only less, I don’t need that much anymore. That is the only thing which we two need less, we need less than in earlier times, right”</p> <p>“You never see me running around sloppily. Never.”</p> <p>“No ‘old grandma-stuff’, oh, that looks great and I buy that”</p> <p>“Yes, these are – are expensive clothes. My cashmere pullovers cost around 200 Euros, they have to become good.”</p>	<p>“I am an outgoing woman. I have so many friends. .. like that. To stay into contact is important to me.. To have a quick glance into the Internet.”</p> <p>“Fresh. Fresh, really fresh bed linen that has been dried outside is thrice as fresh as out of the tumble dryer.</p> <p>“I would go home first and have a look into the internet, what do they cost there. That is the price I would like to have.”</p>

<p>P5</p>	<p>"..and we have always said it that way; we don't want to destroy the good relationship we have with our children by living together."</p>	<p>"I went for a cure several times... And when I could plan that, I wrote down everything on a large A4 (-sized) paper. And there was the telephone, too."          "My husband says that I don't have to do that so often, but I don't feel fine then." "He just does it only when I tell him to do it. Finally, he does it."          "I am no technology-gifted person. Thank God I have got someone for that."</p>	<p>"WHAT I WANT IN ANY CASE IS A PROGRAMME FOR WOOLENS."          "I can't carry heavy things anymore... everything I have mustn't be heavy."</p>	<p>"You have to do it. You have to have the courage to just do it."          "I am really very demanding."          "I am really a fanatic when it comes to cleaning."          "During the last years the family has got smaller and I hardly get a full machine anymore."          "I wait for a week, until the other clothes get dirty and then we wash."</p>	<p>"The first thing my husband does is to look into the magazine Stiftung Warentest"</p>
<p>P6</p>	<p>"There is always somebody there."          "We always help each other,..."          "Yes, we are satisfied with our living situation."          "Everything moves to the city."          "... so there is everything separated, because, as I said, our shopping is different, everybody looks for something different."</p>	<p>"On the other hand, we do things together, too. If we just have two, three piece, I always think, we can fill the machine, so that it is worth it."          "... but for the laundry you have to go some ways... it is quite an old house...."</p>	<p>"There needn't be too many trendies. Just a good wash and spinning and that the time is not too long, with delicates."          "It is a good thing to have a time economy programme, where you can dial the time and where the machine doesn't have to run the whole time, if the laundry is not so dirty."          "If I have coloureds or delicates, I use 30, 40 degrees and, as I said, my blankets, I wash them at 90 degrees, these old ones, 40 years ago. I started with a boiler."</p>	<p>"Only, if there is too much technology inside, I can't cope with that. (If there is too much technology inside, I can't cope with that). So, I can switch it on and off that is what I can do."</p>	<p>"But in the summer, when it is really nice outside, I hang up my laundry outside in the garden."</p>
<p>P7</p>	<p>"I was forty years on duty, from 6 o'clock in the morning until the evening, all day."          "I can enjoy my home today, can go into the garden, or on the terrace and I can relax there."</p>	<p>"... you cook for me, you took over all the things which used to be my task."          "But I take away her work, because I know about the risks accompanying it."</p>	<p>"It has to be relatively easy or normal to operate with the programmes."          "We have a lot of technology inside. But we'll be sorry if the electricity supply brakes down."          "We have computers here. My wife does online-banking and such things."          "A++ and I don't know how many plus signs, they use much less energy than the one from company XY and it has been proved that they don't reach the temperatures, so they also use less energy."</p>	<p>"I think it is important to keep up with the time."          "I taught myself to work with the computer."          "In later years you don't buy that anymore, because they get so old that they survive us."          "And at our age we don't buy them anymore, because they get so old and they survive us then."</p>	<p>"The more important component when you get old is, what we do, too, to have an emergency system by St. John's Ambulance."          "You should also have a neighbour who is nearby."</p>

IP	Independent Living	UD Determinants			
		Household social context	Technological dimension	Personal dimension	External dimension
P8	<p>“Like the way I used to do it, I continue like that, just with a bit more time, more relaxed.”</p> <p>“Yes, I need a structured day.”</p> <p>“Well, I need to have my certain activities, my time for sport, my time to cook, my time to...”</p> <p>“...that you don’t have to pay attention to the price. That you can buy something without calculating...”</p>	<p>“I usually trust someone I know and who is a specialist”</p> <p>“I always tell my washing machine: ‘Girl, please keep on going for a long time...I can’t cope with a new one.’”</p> <p>“I only use it when my husband is there and can intervene.”</p> <p>“My husband doesn’t do anything in the household. He still works. He still works full-time. With nearly 75 years. And still on the road.”</p>	<p>“I have heard of the new machines where you can’t change a programme once you have chosen it. M., for example. That would be terrible for me.”</p> <p>“I am afraid that I could make a mistake or even break something.”</p> <p>“Where I can still intervene, if I do something wrong and choose the wrong programme. That I can stop it.”</p>	<p>“I am a creature of habit”</p> <p>“I don’t think that housework is exhausting, I see it also as a kind of fitness programme.”</p> <p>“I am too old for that, I think I can’t cope with that technology”</p> <p>“Just, what really frightens the people is technology which is hardly controllable.”</p> <p>“I am even afraid of a new washing machine.”</p>	<p>“I’d prefer a well-functioning big family, where everyone looks after everyone else and not just technology.”</p> <p>“But I think you are well-advised at your local dealer.”</p>
P9	<p>“One of our most important criteria was to have good shopping facilities reachable ‘by foot’. Just, because it is livelier around us.”</p> <p>“We know each other and it is like that also in the shops, we are recognized.”</p>	<p>“Doing the laundry? Nothing to worry about for me. It is done now and then.”</p> <p>“I am a decorative accessory” “We have a laundry slide”</p>	<p>“Yes, but I’m afraid of being placed under disability.”</p> <p>“...programme flexibility, short runtimes, good spin rotations”</p> <p>“I prefer buying a device more to having too many functions in one device, I have the experience that if one piece is broken, you are helpless.”</p>	<p>“Well, I don’t need a smartphone, I just want to phone”</p> <p>“I still have dreams”</p> <p>“...it is a fascinating thought that the fridge knows what is missing. Yes, and then you order something.”</p> <p>“I think when I get that old and I forget it, I can’t really handle that device anymore. “</p>	<p>“We explore the market... what are the ... special Stiftung Warentest reports and ask ourselves ‘what are our needs?’.. It doesn’t matter if it costs 600 or 1000 Euros.”</p>

<p><b>P10</b></p>	<p>“But we feel comfortable here. We grew up here, didn’t we?”</p> <p>“And, what is special about our age, everything works more slowly.”</p> <p>“We are alone, we have nobody who comes, nobody who tells us how to do it and who cares for us...”</p> <p>“If somebody comes, that’s fine, but we don’t want to be dependent on this person.”</p>	<p>“That is the reason why she is responsible for the house and I am responsible for the gardening.”</p> <p>“Yes, we have enough to do.”</p> <p>“...but I can’t cope with that. I don’t know... and if you have nobody one can ask: ‘Can you explain that to me, what do I have here...?’, that is quite, quite bad.”</p>	<p>“I actually have that in my machine. You know, you see what you have to adjust”</p> <p>“I think the programme for woollens is also very important, well, I usually wash delicates by hand.”</p> <p>“No, I actually need everything. Have a look at the pre-wash programme, a spin cycle, I need all these programmes. I need a wool programme, “Cold wash” is also what I need, but not very often...”</p> <p>“I would pay more for that... also to save a bit more energy.”</p>	<p>“It could be the case that I just try it, if it comes to my mind. “</p> <p>“A bit of movement is good. And today it is not a burden anymore, because I..., we have more time. We can organize ourselves.”</p>	<p>“I still can’t cope with Google very well”</p> <p>“If it is too cheap, I am sceptical.”</p>
<p><b>P11</b></p>	<p>“I have always wishes and plans.“</p> <p>“Every morning walking or cycling”</p> <p>“We can afford a bit more financially”</p>	<p>“I have got someone in the house who puts the brakes on.”</p> <p>“When he is walking, I mow the lawn.”</p> <p>“Everything gets better. ... You don’t know anything about that, do you?”</p>	<p>“It is easy to operate. You don’t have to think too much about it. Of course, it is not the most modern one anymore, but/ it is durable.”</p> <p>“There are some shirts which don’t have to be ironed, so to say, but you iron them nevertheless? / Because they don’t (laughs) seem to be smooth enough”</p> <p>“That you don’t use so much energy and the price.”</p> <p>“It is a good thing for people who work or are away a lot. We are always at home.”</p>	<p>“We wash too often. She washes much too much. (laughs) “ But I don’t wash too often!”</p> <p>“We are just the ‘old’ generation, aren’t we?”</p> <p>“We leave it the way it was. Next year I will be 80.”</p> <p>“You really want to do a bit on your own.”</p>	<p>“I really have to admit that I don’t use the Internet because I can’t enter it; I am not so familiar with it.”</p> <p>“I wouldn’t buy it there, because I need someone to talk to and such is person cannot be found there.”</p> <p>“...well, usually you take brands that are popular and good.”</p>

<p><b>P12</b></p>	<p>“It depends on your age, like I have said before, to go into the cellar. At a certain age it might be difficult or impossible. Then you have to find a solution...”</p> <p>“It depends a bit on the age, as I have said before, with going into the cellar. This could be a problem at a certain age.</p> <p>“I have got my household help,... I have her for more than thirty years. She is a pearl and she helps me so much and I have got nearly all machines that are on the market.”</p>	<p>“Or he tells me: ‘Mom, how often have I explained the computer to you?’ (laughing) ‘Again? How often have I explained that to you?’. He is right. I say: ‘As long as I have you, you have to explain it to me’. You just don’t try hard enough. Well, I think, he comes once a week. If I had nobody to ask, I would pay more attention.”</p> <p>“I have to dry my laundry in the cellar. So I throw it down the stairs, the dirty laundry...”</p>	<p>“Well, the more technology the more susceptible it is. There used to be two buttons, I had one button for I don’t know what and the other one for the temperature. There wasn’t much technology.”</p> <p>“I wash nearly every day, I don’t care. If it is a Sunday or a public holiday. It just isn’t any work. I put on the machine. Doing the laundry today is no work at all. It just goes into the machine and then shortly into the dryer and I hang it up in the ‘drying room’. So I just dry it shortly, so that it is a bit smooth, so the underwear and so on. Yes and then I hang it up. That is something I can also do on a Sunday.”</p> <p>“At first you really have to deal with such a thing and then you feel like afterwards you are faster if you do it in another way.”</p>	<p>“If my machine gets broken, I always have the newest one on the market.”</p> <p>“I like to run down into the cellar, up again to hang up the laundry and down again, and so on.</p>	<p>“Yes. We have off-peak electricity here and I turn it on at night, do I? So it has a clock timer and it runs at night practically. When I get up in the morning, everything is ready.”</p> <p>“I heard that if I adjust 60 degrees, that it isn’t 60 degrees.”</p> <p>“I think the producers haven’t thought about this at all.”</p>
<p><b>P13</b></p>	<p>“I’ll do what I can and I hope I will have a household help.”</p>	<p>“The machine has been down there for fifty years now.”</p>	<p>“I always think the same: Why do I have to wait so long until the machine is completely full? And that is for a small household...” (P13)</p> <p>“Well, it has never happened to me that I couldn’t remove a stain.”</p> <p>“...that you can read the dial, right? That I don’t have to use a magnifier.”</p> <p>“Some things lie around too long. I think it isn’t enough to wash already, so I put it away, just, because I think that it is a waste of energy and money to wash such small amounts in a big washing machine.”</p>	<p>“I have a small household, I don’t need a lot...”</p> <p>“But I am 67, it doesn’t have to last 30 years anymore, does it?”</p> <p>“Good quality with the low prices. But not at cutthroat prices.”</p> <p>“I am a technical one-off. I can’t imagine such a thing.”</p>	<p>“Permanently, yes. I always said, years ago, ‘I don’t need a...well, computer or something like that.’ “</p> <p>“Well, no, that is nothing for me’, but I have recognized that it is really necessary in many cases, isn’t it? And then I thought: ‘Either I have to say goodbye to this world, or I have to face it, haven’t I? (Laughing).”</p> <p>“Above all, if you fetch it from the chemical laundry, it mostly stinks. Of certain chemical means.”</p>
	<p><i>Sharing and caring Interdependence</i></p>	<p><i>Household communication Socio-technical arrangements Prior experiences and habits</i></p>	<p><i>Technological sophistication Price value Complementary and competing activities</i></p>	<p><i>Use innovativeness Frustration with technology SOC Life course Technical self- efficacy</i></p>	<p><i>External communication Shared conventions Brand relationship Environmental influences</i></p>

## A6) Contextual interviews: Determinants and themes

Table 52: Determinants (Part 1)

Revised Dimensions and Determinants (adapted from Shih&Venkatesh, 2004)		Revised Description and Explanation (adapted from Pink, 2004; Shih&Venkatesh, 2004; Shove, 2003)
Household Social Context	Household communication	<ul style="list-style-type: none"> <li>Technology use (mainly variety of use) is affected by household communication 'intensity' and 'quality' which depends on possibility of peer-to-peer communication (intra-generational) and influence of children (inter-generational)               <ul style="list-style-type: none"> <li>Word-of mouth communication</li> <li>Use of social networks, etc.</li> </ul> </li> </ul>
	Socio-technical arrangements	<ul style="list-style-type: none"> <li>Technology use (mainly rate of use) is embedded in 'pathways' of doing the laundry and rigid 'laundry routes'               <ul style="list-style-type: none"> <li>'Cohesion' of appliances (washer and dryer) results in strong resistance to relocate the current structure</li> <li>Location of washing machine usually in the cellar (through staircases), drying sometimes outside</li> </ul> </li> </ul>
	Prior experience and habits with using technology	<ul style="list-style-type: none"> <li>Repetitious pattern of activities influences variety of use (e.g., hand wash of woollens)</li> <li>Influence of formative period mainly on variety of use</li> <li>How long the household appliance has been used</li> <li>Age of washing machine, dryer</li> <li>Familiarity with and dependence on technology</li> </ul>
Technological Dimension	Technological sophistication	<ul style="list-style-type: none"> <li>Includes the inherent characteristics of a technology, its versatility and capabilities affects mainly variety of use. Level of comfort of users with newest household appliances.               <ul style="list-style-type: none"> <li>Overburdened by smart technologies with functional complexity (variety of use). Familiar user interface and limited range of features preferred.</li> <li>Trade-off 'small wash loads' versus 'energy saving' (rate of use)</li> <li>Strong concern regarding paternalism of technology (variety of use)</li> </ul> </li> </ul>
	Price value	<ul style="list-style-type: none"> <li>Perceived affordability of a product includes price and operating costs, particularly energy costs affecting rate of use.               <ul style="list-style-type: none"> <li>Medium price level preferred with strong link to perceived quality of appliance. Investment calculated from the proximity of death (affects variety of use due to lower specified products)</li> </ul> </li> </ul>
	Complementary and competing activities	<ul style="list-style-type: none"> <li>Relative advantage of substitutes (e.g., not using the appliances due to energy costs) affecting rate of use               <ul style="list-style-type: none"> <li>Hand wash still frequently preferred for special items (e.g., woollens)</li> <li>Dryer usually abandoned for its energy use</li> </ul> </li> </ul>

**Table 53: Determinants (Part 2)**

Revised Dimensions and Determinants (adapted from Shih&Venkatesh, 2004)		Revised Description and Explanation (adapted from Pink, 2004; Shih&Venkatesh, 2004; Shove, 2003)
Personal Dimension	Use innovativeness	<ul style="list-style-type: none"> <li>• Being experimental and having an inclination to try different things affects mainly variety of use.                             <ul style="list-style-type: none"> <li>○ Influence of 'technological biography'</li> </ul> </li> </ul>
	SOC	<ul style="list-style-type: none"> <li>• Technology use to compensate age-related declines (e.g., instead of drying outside in the garden) affects mainly rate of use                             <ul style="list-style-type: none"> <li>○ Technology as (one) means to overcome age-related declines (others: help of partner, domestic helper, take more time)</li> </ul> </li> </ul>
	Frustration with technology	<ul style="list-style-type: none"> <li>• Complex technologies often frustrate users which affects both variety and rate of use                             <ul style="list-style-type: none"> <li>○ Frustration arises because technology fails to perform reliably or meet the user's expectations</li> <li>○ Breaking links of practices through new, unfamiliar technologies causes fear</li> </ul> </li> </ul>
	Life course (Mathur&Moschis 2005; Loe, 2014)	<ul style="list-style-type: none"> <li>• Events in life affect housework and the rate of use of technology                             <ul style="list-style-type: none"> <li>○ Major change in usage pattern due to retirement or death of a partner</li> <li>○ Clothing has a strong influence to counter stereotypes</li> </ul> </li> </ul>
	Technical self-efficacy (Chen&Chan, 2014; Czaja et al., 2006)	<ul style="list-style-type: none"> <li>• One's belief to be able to cope with technology affects variety and rate of use                             <ul style="list-style-type: none"> <li>○ "Learned helplessness" (Norman, 2013) affects mainly rate of use</li> </ul> </li> </ul>
External Dimension	External communication	<ul style="list-style-type: none"> <li>• A supportive social environment: speaks to neighbours and friends, uses social networks to talk about technology (affects both variety and rate of use)                             <ul style="list-style-type: none"> <li>○ High exposure to media stimulates involvement with technology</li> </ul> </li> </ul>
	Shared conventions	<ul style="list-style-type: none"> <li>• Following norms regarding cleaning standards affects variety and (mainly) rate of use.                             <ul style="list-style-type: none"> <li>○ Perfect clean laundry has become a cultural ideal</li> </ul> </li> </ul>
	Brand relationship (Aggarwal, 2004)	<ul style="list-style-type: none"> <li>• Familiarity with and dependence on certain brand and product leads to 'social relationship' to brands and products affects both variety and rate of use.                             <ul style="list-style-type: none"> <li>○ High emotional attachment to products</li> <li>○ 'Socialized member' of the family</li> </ul> </li> </ul>
	Environmental influences	<ul style="list-style-type: none"> <li>• Weather (e .g. for drying) or daytime (energy saving times) affects rate of use                             <ul style="list-style-type: none"> <li>○ Image of freshness in drying outside</li> </ul> </li> </ul>

## A7) Contextual interviews: Personas

Persona "John" (interview participant P1)	
<b>Personal data:</b>	John is 69 years old and was a civil servant. He feels much younger: "I guess I am still around 60, yes." Meanwhile he has retired and lives with his new partner in a two-storey house with garden. He does not have a dryer as he prefers drying outside or in the cellar on a drying rack.
<b>Statement:</b>	"...., somehow it smells different. Fresher, somehow... and when you lay down in your bed, there is somehow something positive about it, when you smell the free nature..." (this quote relates to drying clothes outside)
<b>He is ...</b>	...really satisfied with his current way of living. "It is not possible to live better than this". He enjoys the flexibility of retirement, to do whatever he likes whenever he likes. He is still interested in the latest technology and enjoys his new tablet. Doing the household for him is a necessary evil. He learned from his mother and his first wife how to deal with the laundry and other tasks. In his new relationship he has a special task: he puts the wet laundry on the drying rack and does the garden work. On the other hand he sees domestic work in another light: "I have to say that domestic work has never been a pleasure to me. Has never been. "
<b>He wants ...</b>	...to have the sensory experience of "fresh laundry". When it is the right weather, he puts the wet laundry on the drying rack in the garden. What is more, the fresh air is also an important reason for drying the laundry outside. He is open-minded to new technologies, if they are not too complicated. He sees advantages of monitoring the washing machine operation via a Smartphone: "This is especially good for someone who lives on the 10th floor and whose washing machine is located in the cellar. That is really useful practice."
<b>He is concerned about ...</b>	...the stairs leading into the cellar. "That has always been dangerous. Not for me, because I grasp the basket with one hand, but for G. (John's partner) walking down the stairs with no hands that is not easy at all."
<b>User typology</b>	Intensive use (lead user)

Persona "Elisabeth" (P13)	
<b>Personal Data:</b>	Elisabeth is 76 years old and a retired teacher. She lives alone in a big house near to town. She does gymnastics regularly, doesn't use the Internet very often,
<b>Statement:</b>	"I always think the same: If only I had a washing machine that could wash little amounts of laundry economically"
<b>She is...</b>	...often tired after domestic work. She mentions: "...for all the mentioned activities so much life time is wasted!" She refuses to wash small amounts of clothes. "My machine washes well, but I have to have enough laundry, otherwise I have a bad conscience." Most of her delicate items like her woollen pullovers she washes by hand because she does not trust the machine. She has a bearish attitude towards new technologies, which she justifies with her experiences in the past. "Because I have always had difficulties with technology." Elisabeth characterizes her absent understanding of technology in a humorous way: "I am a technical one-off." Nevertheless, in the meantime she has also a computer as she wants to stay connected to the outside world. "I always said, years ago, I don't need a computer or something like this, no, that's nothing for me, but I have realized that in a lot of areas you really need one."
<b>She wants...</b>	...to have a washing machine that washes small amounts of laundry without wasting too much electricity. Better readability of the displayed programmes is an important issue for her. Furthermore, she wants to stay active and hopes that new technologies do not make her passive: "I have to move! I have problems with my locomotive system ... as long as I move, it gets better." When it comes to the longevity of washing machines she has a clear picture: "But I am 76, it doesn't have to last for 30 years"
<b>She is concerned about...</b>	... the lack of respect some specialist retailers show in dealing with an older, single woman: "If a woman stands there all alone, that's usually bad." She experienced a kind of social discrimination by the shop staff who did not take her complains and arguments seriously, which really annoyed her: "I could have made mincemeat of this store – as if I was stupid."
<b>User typology</b>	Limited use

Persona "Laura" (P10)	
<b>Personal data:</b>	Laura, 72 years, and her husband Charles, 73 years, have both retired. She worked as a secretary and he was a clerk. They are still active and frequently enjoy overseas holiday destinations. As the house and the garden is with over 1000m2 rather huge for them, they have lent the upper apartment to a student.
<b>Statement:</b>	"... you really get afraid of all this" (this quote relates to the work in their huge, cultivated garden with old trees and grassland).
<b>She is ...</b>	... more relaxed nowadays: "...concerning window cleaning, we have taken it more seriously in former times." Laura thinks her domestic work is still manageable, if she is not in the mood for this work, she delays it to the next day. Her husband helps her whenever he can, and she likes that a lot. But, there is a clear segregation: Charles does all the work in their huge garden, whereas Laura does all the work in their house. He points out: "... that is just how it is, 2 hours is the time I need. It gets longer every time, as I am not the youngest anymore" She has support from a domestic help. Doing the laundry was always important for her. Laura sees the slowing of their rhythm of life as an advantage of ageing. On the other hand, old age also brings disadvantages, as there are the rising physical limitations they face which affect their daily activities: "Well, I need much more time today."
<b>She wants ...</b>	...neat clothes, because a good appearance belongs to her well-being. From the technology she requires short washing cycles, so that she is able to wash the laundry fast, without waiting too long. She has a critical view on the dryer, as it has caused some damages to the clothes in the past. When it comes to domestic tasks the most important concern for them is the treatment of the huge garden which is getting harder: Technology does not really offer help in that matter. Charles is not convinced to buy a robot lawn mower, like the one his neighbour has, because he would miss the activity and movement. They both have different attitudes towards new technologies: "a smartphone would really interest me..." she says, but she needs somebody to assist her.
<b>She is concerned about ...</b>	... the upkeep of their living space inside and outside their house. Once in a while they think about moving to a different place with assistive living in the city centre: "We are alone, we have nobody who cares for us."
<b>User typology</b>	Specialized use

Persona "Anna" (P 6)	
<b>Personal data:</b>	Anna is 71 years old, lives in a five person, multigenerational household. Together with her retired husband, daughter and granddaughter they live in a two storey house in a small village. Despite living together, Anna and her daughter have separate washing machines placed in the cellar.
<b>Statement:</b>	"... the washing machine never runs with two or three pieces... I hate that like hell... yes, because of the water and electricity consumption. It has to be paid..."
<b>She is...</b>	...the social centre of the family. The awareness, that she can rely on her daughter and granddaughter, who live in the same house, in case of an emergency or difficult situations, is a great emotional support. "... There is always somebody there." They are a close family. The cardinal point is the solidarity in the family. "We always help each other..." When it comes to shopping, Anna is price conscious, on the weekends she regularly compares special offers in the newspapers as her granddaughter underlines: "It is always the bargains with granny, right? Every time the newspaper gives away the snips." New technologies do not attract her, usually others have to help out with technical tasks. She prefers face-to-face communication and shows little interest in the Internet. She believes that in this modern society neat clothes have a high significance. In general, doing the laundry is no problem: "but ironing that is a horror to me ..... I always have to fight my weaker self. But unfortunately this work has to be done, too." She is energy-conscious for cost reasons. As such, she would never wash small loads because it would mean a waste of electricity and water.
<b>She wants ...</b>	.... to keep her freedom and her independence when it comes to domestic tasks. This helps to limit conflict when it comes to different concepts about the right way how to do the laundry. The prospect of saving money through consuming less energy can also be seen as part of the negotiation of her priorities when it comes to drying. In her view the perfect scenario is to dry the laundry outside in the garden "in the fresh air".
<b>She is concerned about ...</b>	... the relocation of shops and doctors into the city centre of towns and her dependence on the car because of poor public transport facilities.
<b>User typology</b>	Specialized use

Persona "Rebecca" (P 8)	
<b>Personal data:</b>	Rebecca, 70 years, was a clerk. Rebecca is sportive and likes to go walking regularly at the weekends together with her 75-year-old husband. "Nothing and nobody" can change this routine because they are real nature lovers: "To experience nature, that is the most important thing." Rebecca has a washing machine that is 25 years old, she does not have a dryer.
<b>Statement:</b>	"I really like to remain at the wheel" (with this statement she underscores her wish to control things and criticizes the rising dependence on technology).
<b>She is...</b>	...quality and brand-conscious when it comes to household products. She describes herself as anxious character when it comes to new technologies as she is afraid to do something wrong. In general she has a more relaxed attitude towards housework. The transition into her retirement was not easy for Rebecca. "It took a while until I found the routine I have now." Domestic work used to be a stress factor while she was working. Nowadays, it is the contrary, she makes housework serve her. Domestic work is also a kind of workout for her: "I don't think that housework is exhausting, I see it also as a kind of fitness programme." Ironing is something she really likes: "I iron every piece of laundry..."
<b>She wants...</b>	...to keep control over technology. Paternalism by technology is something that worries her a lot. She demands programmes which are flexible and can be adjusted. She has almost a social relationship to her washing machines: "So, do as you are told, and not the other way round!" Technologies that remove control from her cause worry her: "I am even afraid of a new washing machine." That is why she wants to stay with her current washing machine and talks to her: "Girl, please keep on going for a long time... I can't cope with a new one." She wants to have a simple machine operation. "A machine with a great big fuss, that's nothing I want, I want to have it as simple as possible."
<b>She is concerned about ...</b>	...the increasing impact of technology in daily life and the losing of control over technology is a great concern. She is of the opinion that "you have to see the human being, more than what technology can do... this surveillance is horrible." The progression of technology frightens her: "I'd prefer a well-functioning family"
<b>User typology</b>	Specialized use

Persona "Mary" (P 2)	
<b>Personal data:</b>	Mary is 67 years old, has two grown up sons, and lives meanwhile by herself in her house with garden. The family life was determined by the business of her husband who passed away shortly after his retirement started. She has two washing machines, one is 12, one 9 years old. She does not have a set laundry day.
<b>Statement:</b>	"You really have to reorganize yourself" (since she is living alone she has to make amendments to her daily routines).
<b>She is...</b>	... fashionable and wears "whatever makes you stylish. You have a totally different appearance then" Her husband worked very hard in his life and his work determined their weeks and weekends. Now she has to make a new start which affects all areas of life also buying grocery and doing the laundry. In general, she is open to new technologies and has recently bought a new high-tech oven with induction functionality. The smartphone is a helpful daily device.
<b>She wants ...</b>	... to have quality products. Nevertheless she has doubts: "I think, they don't last that long." She is open towards new household technology. Although it was against her husband's will, she bought a new, very expensive oven with a high-tech induction field. On the other hand, she would not pay so much money for a washing machine. "I would only buy a middle-priced one... not the most expensive one, but at a medium price..." For economic reasons Mary does not like to wash small amounts of laundry: "I have never washed a single piece alone." It is out of question for her to place the washing machine somewhere else than in the cellar. "I want to have it in the cellar. Most of all because I have the dryer next to it and in the next room, I can hang up the laundry."
<b>She is concerned about ...</b>	...her current state of health and the insecure time of living alone: "I don't show it openly"
<b>User typology</b>	Limited use (uses two wash machines for different types of laundry)

Persona "Luise" (P 3)	
<b>Personal data:</b>	75-year-old Luise is widowed and has four grown up children. She lives alone in a semi-detached house with a small garden.
<b>Statement:</b>	"We have everything behind us. I don't have any ideas for something new."
<b>She is...</b>	... a technically indifferent person. She has a critical and rejective attitude towards the usage and purchase of any new household appliance because of her perceived limited 'time left'. She does not know what exactly new washing machines can offer and is not interested in getting more information. She firmly opposes any support in domestic task: "No, I can do everything on my own." Luise firmly states that what she already owns is fully sufficient, fashion or buying new clothes is something irrelevant for her: "...we have everything behind us, those years." She is not familiar with the computer and the Internet, uses only traditional communication devices like telephone. Doing the laundry is something she likes: "I like to wash, and I like to hang up the laundry, too." because it helps to stay active: "I enjoy to run the stairs up and down... so that I can move early in the morning"
<b>She wants ...</b>	... to stick to her well-ordered routines. Luise does not want to buy new household products: "No, I don't need that kind of stuff". Luise protests against new technologies. If her health situation gets worse the consequences are obvious for her: "No, we don't do anything anymore. If I can't do that anymore, I will have to go into a home for the aged." Devices must offer the possibility to make a practice much easier, should be easy to handle, not get broken. She is quick to declare that the quality of household appliances at this age does not matter anymore: "... these few years we still have... it doesn't have to last 30 more years." In case her washing machine breaks down, she would prefer to buy exactly the same machine again, as she fears that any other type would be too complicated for her: "I'd buy the same one again, we could cope with this one very well." She still prefers to hand wash many items in the sink: "I love to wash it by hand. They always laugh at me about this. "
<b>She is concerned ...</b>	... to be alone in the big house without help: "I don't stay alone here"
<b>User typology</b>	Limited use

Persona "Greta" (P 12)	
<b>Personal data:</b>	Greta is 69 years old, she has a grown up son and is married to her husband Ludwig who was a business manager. Meanwhile both have retired. Greta is sporty and likes to socialize.
<b>Statement:</b>	"The more technology they have, the more breakable the devices are - unfortunately."
<b>She is ...</b>	...very satisfied with their current life which is influenced by a close and cooperative partnership and their financial security. A very important support in the household is their longtime household helper.. "This is a reason why I feel very good, I have to say... like a dream" To wash the laundry is nowadays no problem for Greta anymore. "Doing the laundry is no work", which is shown in the frequency she washes. "I nearly do the laundry every day." She compares this to her experiences as a child: "About once in a month, there was a washerwoman, then there was a woman who helped with the ironing, then we had a maid that helped my mom, my father cooked. Five people were involved."
<b>She wants ...</b>	... to keep their domestic helper as long as possible. Greta is particularly aware of energy saving times and prefers to do the washes when energy costs are low. A delay start function on a washing machine is a useful feature for her as she can adjust the programme start according to energy saving times. The wish to save energy is also the reason to use the dryer seldomly. Usually she just shortly dries the laundry and thereafter she hangs it up. The washing machine is located in the cellar, through a steep staircase. To relocate it in their living area is not negotiable because the whole washing and drying process takes place in the cellar, this would be inconvenient: "I'd have to carry the wet clothes that is even heavier." When it comes to larger investments, she looks out for the brand and a high quality: "If I buy something, I always buy something fine."
<b>She is concerned about ...</b>	.. the consequences when the helper retires: "This is going to be a big change for us."
<b>User typology</b>	Intensive use (lead user)

Persona "Carla" (P 11)	
<b>Personal data:</b>	Carla, 71 years old, and Frank, a former civil servant, 79 years, live in their own house for almost 40 years. They lead an active social life, travelling, outdoor activities like cycling or hiking are important to them. As well as meeting friends on the market in regular intervals.
<b>Statement:</b>	"We are the old generation. New technology is not for us, this is for a younger, working generation"
<b>She is ...</b>	...adhering to the traditional gender roles. "We are still the old generation". He, with almost 80 years, loves to go for a hike, it is his passion. "Yes, ten kilometres in the mountains up and down, up and down." Carla describes the current fitness situation of her husband as: "He is well-maintained". They live in the perfect agreement of well-ordered habits. When it comes to do the laundry she has a high standard: "...well, there are shirts which don't have to be ironed, but you iron them nevertheless, because they don't seem to be smooth enough." The high standards of cleanliness and tidiness, the overall agreement about domestic responsibilities means that there is little friction between them. However, when it comes to usage patterns they have different views: "We wash much too often. She washes too much. (laughs)" " But I don't wash too often!"
<b>She wants ...</b>	...control over the day-to-day activities is an important topic for her. From her point of view, also in the future she wants to be able to cope with the domestic tasks without any help: " Well, I can still do that alone." For the time being, a domestic help is not considered: "But not now!" When it comes to household products, brand and quality play an important role: "I look for brand products, I have to rely on something." She likes to have a smartphone. However, to convince her husband seems to be not that easy: "I have got someone in the house who puts the brakes on." He is opposed when it comes to new technologies because this is something for a different, much younger generation. The same applies to the usage of the washing machine, he knows little about washing clothes: "I can't use the washing machine."
<b>They are concerned about ...</b>	... the reduced level of quality for household appliances.
<b>User typology</b>	Specialized use

Persona "Larry" (P 7)	
<b>Personal data:</b>	Larry, 72 years, worked in a hospital, now retired, he devotes his time to voluntary service. Everything he does and thinks revolves around this activity.
<b>Statement:</b>	"Because at our age we lose the sensitiveness and with little buttons, this is not possible."
<b>He is ...</b>	..... enjoying his home and the newly gained freedom: "I can enjoy my home more... I used to work 60-80 hours a week, sometimes even more..." The reorientation was not easy ("big holes"), but now he does voluntary service. He does this with great enthusiasm, because it is close to his heart: "Why shouldn't I pass my knowledge to others ...". In addition, he lays all his power in the caring for his wife which also includes his engagement in many household tasks, however still learning new things: "Well, I am still not very suitable for the household." His wife appreciates his well-intended support. On the other hand it is important to her to regain her self-determined life-style of the past.
<b>He wants ...</b>	...that technology makes life easier. He always thought that doing the laundry was important to them. Nevertheless, he would not buy an expensive washing machine with longevity. "And at our age we don't buy them anymore, because they get so old and they survive us then." When it comes to technology his wife wishes that her physical capabilities are considered while using the machine: "...because at our age we lose the sensitiveness and with little buttons, this is not possible." When it comes to domestic work, their big household is really challenging, which is only manageable with high-tech support (e.g., stair lift) and additional external help. "There is a lot of room here, from the cellar to the attic, this is a lot of work to be done." She wants to keep the flexibility and is concerned about paternalism by technology: "I would like to press some buttons according to my rhythm and I don't want the machine to do that for me."
<b>They are concerned about ...</b>	....an emergency situation in the household when he is not present. He wants his wife to be looked after, therefore he closed an emergency contract with a health care organization.
<b>User typology</b>	Non-specialized use

Persona "Susan" (P 4)	
<b>Personal data:</b>	Susan, 70 years old, was married to her husband for 40 years. After her husband died a couple of years ago, she found a new love and partner, who by now lives with her in her house. She has a young woman's ambition to be in or be ahead of others. "I am 70 and I am fit"
<b>Statement:</b>	"What kind of an age do we have? What about 70? That's nothing."
<b>She is...</b>	... a very sociable, communicative woman: "I am an outgoing woman". She loves her independence ("we have separated wallets and accounts") and has no fear of new technological developments. Susan's life-style reflects materialistic values that are more often associated with the young. The usual pictures that go together with old age have an influence on her self-perception. Susan fears a stigmatization of her age and dresses in a modern way: "no old grandma-stuff". In the last year a single piece of technology has revolutionized her life: a Samsung tablet. She has used a mobile phone for some years, but found the tablet more appealing due to the possibility to access the Internet, make photos and write E-mails. Domestic work has changed, there is not much to be done anymore, the only child left home and a domestic helper takes care of exhausting jobs. Neat clothes are very important. The shirts and pullovers are taken to the dry cleaner: "I don't wash shirts and pullovers, I give them away"
<b>She wants...</b>	... to stay up to date. Although being a 70 year-old grandma herself, she does not want to be associate with it: "Old grandma-stuff" is for example a skirt and a blouse and, what is more, a vest or something on top, in beige – such a beige poplin vest." Quality at a reasonable price is important for her, she compares the offers in the Internet. When it comes to aggressive offers she doubts the quality of the products and refuses them vehemently. "No, in no case. You could give it to me for free... well, for a student in a student room maybe. But not for a 70 year-old housewife." Special retail outlets are rejected by her, she likes to buy at a specialized dealer. "He can explain everything to you". She does not want to have a dryer at the moment, likes the fresh air, as it is cheaper and environment-friendly.
<b>She is concerned about ...</b>	... being alone in such a big house: She has some concerns if she is able to cope with all the domestic tasks in her big house in the future: "I don't know. if we are still able to run this house easily with 80." However, the movement to a nursing home would be a hard step for her because "everything is compulsory."
<b>User typology</b>	Non-specialized use

Persona "Lara" (P 5)	
<b>Personal data:</b>	Lara, 67 years old, is still working, whereas her husband retired earlier. She is a very active, communicative person. Housework is getting more demanding for her: "After all I have to clean 250 m <sup>2</sup> "
<b>Statement:</b>	"I am in my own way. ...., it is just that I am really very demanding" (she discloses that with this attitude to 'perfection' she is getting into a trap of her own making).
<b>She is...</b>	...a perfectionist when it comes to domestic work. To have everything clean and tidy is important for her. She associates cleanliness with well-being: "... you don't feel comfortable." Although Lara has some physical limitations: "....I can't carry heavy things anymore" this is not severe enough to keep her from carrying on with her busy life and she does the laundry on her own without any extra help. She describes her excessive approach to perfectionism: "Well, it is just that I am really very demanding." However, she is not able to change it: "I am in my own way". In the past she was almost fanatical about ironing: "... I used to iron even the underwear, but I don't do that anymore, I just fold it."
<b>She wants ...</b>	....a wash programme for woollens: "WHAT I WANT IN ANY CASE IS A PROGRAMME FOR WOOLLENS. So if I have a pullover, pure wool, no mixture, then I can't put that in, that doesn't work out." She would prefer a washing machine that could also wash small amounts of laundry in an economical way. "So I would never just put in two or three pieces." Quality and brand are important to her, a cheap washing machine is out of question for her: "If you have such a family status, ok, but I don't want to have such a thing." She is rather open-minded and used to innovative products. During the nineties she belonged to the early adopters of mobile phones. Her attitude to new technologies is reflected in her motto: "You have to move with the time", even if it costs her quite an effort. She wants a "good manual" from the industry to get clear instructions about product operation possibilities.
<b>She is concerned about ...</b>	.... about the energy consumption of her dryer: "But I bought that one when we moved here, that must have been around 1986. So, now you can imagine how old that thing is. I DON'T WANT TO KNOW HOW MUCH ELECTRICITY IT NEEDS. WE HAVEN'T TRIED IT, BUT I DON'T WANT TO KNOW IT."
<b>User typology</b>	Intensive use (lead user)

Persona "Barry" (P 9)	
<b>Personal data:</b>	Barry, now retired with 63 years old, was a former engineer and worked also abroad for various companies. Just a few years ago they moved to the city centre of Hamburg, where everything is in reach for them. It has become their centre of living: "because Hamburg always offers something that is important for us."
<b>Statement:</b>	"So, there are many things you can still do as an active person. I think when I come to that age, where I forget things, then I cannot control such a device anymore, too."
<b>He is ...</b>	...a cultural and design interested person. He can be described as a cosmopolite, socially well connected and up to date when it comes to technology: "...we are Apple-maniacs" After his preterm retirement, it was important to him that he is still mentally challenged and can fulfil his dreams. They have a laundry slide leading from the bathroom to the cellar, so that bothersome carrying of the laundry basket is omitted. Doing the laundry is Margret's job, she has a nicely furnished room where appliances, hangers and detergents are well-ordered: "... I have a room in the cellar where I can do my laundry, which is very comfortable. ...so that it is no imposition."
<b>He wants ...</b>	...high quality products, also for household appliances, so that they last as long as possible, Therefore a 'good' (timeless, classic) design is important: "Our principle is to have a good design and good quality, because it lasts longer then." New technologies that support to organize their social life are perceived as very attractive. When it comes to domestic tasks, they have more important things in life to do than doing the laundry which is something that happens without much planning and consideration. Margret does not really worry about it because it happens: "between the ways". For doing the laundry he wants to have a possibility to have fresh laundry without much hassle: "That the laundry blossoms again, fresh, on its own..." Despite his high interest in technology ("We are Appled"), a smart phone that shows the progress of the wash programme duration would be a move into a wrong direction: "This is really unnecessary for me". He sees this case as over-technological. Technological assistive systems that facilitate to check his health at home are perceived as useful: "A short diagnosis taken at home. You don't have to walk long distances to the doctor."
<b>They are concerned that ...</b>	...the fast technological progress leads to passivity and dependence "we incapacitate ourselves too much"
<b>User typology</b>	Intensive use (lead user)

## **A8) Contextual interviews: Topic guide**

### **I. Persönliche Dimension (personal dimension)**

#### **1. Selbstständigkeit allgemein (independent living)**

Offener (narrativer) Grundreiz (initial general question):

- Wenn Sie am Wochenende einkaufen gehen, was ist Ihnen dabei besonders wichtig? (When you go shopping on the weekends, what is important to you?)

Worauf achten Sie beim Einkaufen? (Where do you pay attention to? What do you look for particularly when you go shopping?)

- Wie kommt das dazu, dass Ihnen das wichtig ist? (Why is this important?)
- Was ist Ihnen noch wichtig im Leben? (What else is important in life?)

#### **2. Selbstständigkeit/subjektives Wohlbefinden (independent living/well-being)**

Oberfrage (main question):

- Welche Aktivitäten bereiten Ihnen besonders viel Freude? (Which activities do you enjoy most?)

Unterfragen (sub-questions):

- Welche Hobbies haben Sie? (Which hobbies have you got?)
- Welche Aktivitäten unternehmen Sie in Ihrer Freizeit am liebsten? (Which activities do you do at the weekends?)
- Es gibt ja ein Sprichwort: Man ist immer so alt, wie man sich fühlt. Wie ist das bei Ihnen? (There is a saying: "You are as old as you feel." How is it in your case?)
- Wie zufrieden sind Sie mit Ihrem persönlichen Wohlbefinden? (How satisfied are you with you general well-being?)

#### **3. Wohnsituation (living situation)**

Oberfrage (main question):

- Was gehört alles für Sie zu einer guten Wohnung bzw. Wohnsituation dazu? (What do you consider as a good living situation?)

Unterfragen (sub-questions):

- Wenn Sie ihre Wohnsituation ändern könnten, was werden Sie ändern? (If you could change your living situation, what would you change?)
- Wie werden Sie in 10 Jahren wohnen? (How will you live in 10 years?)

#### **4. Biografische Fragen (life course changes)**

Oberfrage (main question):

- Wie hat sich Ihr Leben durch den Ruhestand verändert? (How has life changed for you after your retirement?)

Unterfragen (sub-questions):

- Wie hat sich die Hausarbeit verändert? (What has changed?)
- Wann haben Sie Ihre erste Waschmaschine angeschafft? Wie war das damals für Sie? (What was it like when you bought your first washing machine? When you bought your first washing machine, how was that?)

#### **Bilanzfrage (am Ende des 1. Teils) (concluding question about ageing)**

- Was meinen Sie wie zufrieden sind Sie – alles in allem – mit Ihrer gegenwärtigen Situation? (What do you think, overall, how satisfied are you with your current situation?)

## **II. Sozialer Haushaltskontext (household social context)**

### **1. Haushaltstätigkeiten (domestic activities)**

Oberfrage (main question):

- Bitte beschreiben Sie einmal wie sich die Hausarbeit in den letzten Jahren für Sie verändert hat (Please describe how housework has changed over the years)

Unterfragen (sub-questions):

- Welche Haushaltstätigkeiten führen Sie in der Woche durch? (Which domestic activities do you do on a regular weekly basis?)
- Welche Tätigkeiten können Sie nicht mehr durchführen? (Which activities are more difficult for you?)

## **2. Evaluation von Haushaltstätigkeiten (evaluation of domestic activities)**

Oberfrage (main question):

- Welche Tätigkeiten sind mühsam/lästig, welche gehen Ihnen eher leicht von der Hand? (Which activities are more difficult for you and which ones are rather easy to accomplish?)

Unterfragen (sub-questions):

- Wie kommt es, dass diese für Sie mühsam/lästig sind? (Why are they more difficult for you?) Bitte beschreiben Sie einmal ganz genau, welche Probleme Sie da sehen? (Please explain in more detail which problems you face)
- Gibt es Hausarbeiten die Ihnen Spaß machen? (Are there domestic jobs which you enjoy?) Warum machen gerade diese Ihnen besonders viel Spaß? (Why do you enjoy them most?)
- Wie bewerten Sie die folgenden Tätigkeiten? (How do you feel about the following tasks)
  - Gardinen aufhängen (hanging up the curtains)
  - Wäsche waschen (doing the laundry)
  - Bügeln (ironing)
  - Kochen (cooking)
  - Staub saugen(vacuum cleaning), etc.

## **3. Routinen/Arbeitsorganisation (routines/organization of activities)**

Oberfrage (main question):

- Wie organisieren Sie Ihre Hausarbeit? (How do you organize your housework?)  
(→ erst dann nach geschlechtlicher Arbeitsteilung nachfragen)  
(→ after this ask for segregation of tasks)

Unterfragen (sub-questions):

- Haben Sie einen festen Wochenplan für die Hausarbeit? (Do you have a fix plan/routine in doing the housework?)
- Gibt es Unterstützung für Sie? Gibt es eine Aufgabenteilung zwischen Ihnen und Ihrem Mann? (Who helps you? Is there any separation of tasks?) Gibt es Tätigkeiten, die Sie auch Ihrem Mann übertragen? (Are there jobs which your husband takes over?)

#### **4. Unterstützung der Selbständigkeit (enhancement of independent living)**

Oberfrage (main question):

- In welchen Bereichen hätten Sie gern Unterstützung? (In which areas would you require support?)

Unterfragen (sub-questions):

- Haben sie eine Haushaltshilfe? (Do you have a domestic help?) Wozu? (Why?)
- Was erledigt die Haushaltshilfe für Sie? (In which areas does she help you?)

#### **5. Einstellung zum Konzept Techniknutzung/Innovationen (perception of use innovativeness/technical self efficacy/frustration with technology)**

Oberfrage (main question):

- Für Sie persönlich: ganz allgemein, was würde Ihr Leben vereinfachen? (For you personally, what would make your life easier?)

Unterfragen (sub-questions):

- Wie sehen Sie das: Bieten neue technische Entwicklungen eher eine Vereinfachung des Lebens oder machen die das Leben eher komplizierter? (How do you see it: are new technologies a simplification of life or do they make it more difficult?)
- Wie bewerten Sie Ihre Fähigkeiten im Umgang mit Technik? (How do you evaluate your technical abilities?)
- Welche Bedeutung hat der Computer/das Smartphone für Sie? (Which significance has a computer/smartphone for you?)
- Welche Tätigkeiten führen Sie mit dem Computer/Smartphone durch? (For which tasks do you use a computer/smartphone?) (Which tasks are done by you with your computer/smartphone?)  
(z. B. Mails mit Enkeln, buchen von Reisen, bestellen von Büchern) ( e.g., mailing with children, booking of holidays, ordering books)
- Wie könnte der Umgang mit Haushaltsgeräten Ihnen mehr Spaß machen? (How could the use of household appliances make fun?)
- Es gibt mittlerweile von vielen Herstellern Robot Sauger. Wenn ihr aktueller Staubsauger kaputt geht, würden Sie einen Robot Sauger kaufen?  
(Meanwhile, there are robot vaccum cleaners available to ease the burden

of vacuum cleaning. If your current vacuum cleaner broke down, would you buy such an appliance?). Warum? (Why?)

### **III. Technologische Dimension (technological dimension)**

#### **6. Technische Ressourcen (technological sophistication)**

Oberfrage (main question):

- Was ist Ihnen bei Haushaltsgeräten besonders wichtig? (What is important for you regarding household appliances in general?)

Unterfragen:

- Worauf haben Sie bei der Anschaffung Wert gelegt, was war Ihnen nicht wichtig, d.h. worauf können Sie verzichten? (What was your main purchasing criteria when you bought your last appliance? What was of importance for you? What was dispensable?)
- Welches Haushaltsgerät haben Sie zuletzt gekauft, d. h. wann haben Sie die letzte Anschaffung getätigt? (Which household appliance have you bought recently?)
- Wie zufrieden sind Sie mit Ihrer aktuellen Maschine? (Are you satisfied with your current device?)
- Würden Sie diese wieder kaufen? (Would you buy it again?)

#### **7. Einstellung zum Konzept Qualität/Service (perception of quality/service)**

Oberfrage (main question):

- Welche Bedeutung hat Qualität bei Ihrer täglichen Hausarbeit? (How important is quality?)

Unterfragen (sub-questions):

- Wie lange muss ein Haushaltsgerät halten? (How long must a household device last?)
- Im Falle eines Produktdefekts, was machen Sie dann? (If the machine is defective, what do you do?)
- Was erwarten Sie von dem Service eines Herstellers? (What do you expect from the service of a producer?)

## **8. Einstellung zum Konzept Bedienkomfort (perception of user convenience)**

Oberfrage (main question):

- Wenn Sie an die Handhabung eines Haushaltsgerätes denken, was ist Ihnen wichtig? (When you consider the usability of a household appliance, what is important?)

Unterfragen (sub-questions):

- Was macht für Sie Bedienkomfort aus? (What does user convenience mean to you?)
- Was erwarten Sie von einem Haushaltsprodukt hinsichtlich Bedienkomfort? (What are your expectations concerning user convenience?)
- Haben Sie eine Idee wie kann man z.B. den Bedienkomfort bei Ihrer Waschmaschine verbessern kann? (Do you have an idea how to improve the user convenience of your washing machine?)
- Und wie beurteilen Sie z.B. den Bedienkomfort ihres Handys (How do you judge the user convenience of your smartphone/ mobile?)

## **9. Einstellung zum Konzept Preis (affordability) / externe Kommunikation (external communication)**

Oberfrage (main question):

- Was verstehen Sie unter einem guten Preis-/Leistungsverhältnis? (What do you understand by good value for money?)

Unterfragen (sub-questions):

- Wie wichtig ist Ihnen der Preis beim Kauf? (How important is the price?)
- Wann kommt Ihnen bei einem Gerät der Preis suspekt vor? (When is the price too low for you?)

Bei manchen Geldausgaben muss man abwägen, ob man sich das leisten kann. Wie wäre es bei Ihnen, wenn Ihre Maschine kaputt geht.

(For some expenditures you need to consider if they are worth it. Imagine your machine broke down, how much money would you spend for a new washing machine?)

Oberfrage (main question):

- Worauf achten Sie beim nächsten Kauf? (The next time you purchase a new machine, what do you pay attention to?)
- Was ist Ihnen besonders wichtig? (What is most important?)

Unterfragen (sub-questions):

- Wie gestalten/handhaben Sie für sich das Preis-Leistungs-Verhältnis beim Kauf einer neuen Maschine? (How do you evaluate the price-value relationship?)
- Welche Eigenschaften müsste eine Waschmaschine unbedingt haben? (Which features are mandatory for you?)
- Was ist Ihnen wichtiger ein guter Bedienkomfort oder hohe Qualität? (What is more important: a good user convenience or high quality?)
- Was ist Ihnen wichtiger ein günstiger Preis oder ein guter Bedienkomfort? (What is more important: a low price or a good user convenience?)
- Was ist sonst noch wichtig? (What else is important?)
- Wie und wo informieren sie sich? (How and where do you receive information?)

#### **10. Einstellung zum Konzept Reinigungsleistung/Sauberkeit (image of cleanliness/technological performance)**

Oberfrage (main question):

Bei welcher Funktion eines Haushaltsgerätes würden Sie keine Kompromisse bei der Leistung eingehen? (Concerning which features and functions would you not accept any compromises?)

Unterfragen (sub-questions):

- In welchen Lebensbereichen ist Ihnen Sauberkeit besonders wichtig, wo kommt es eher nicht so darauf an? (In which areas is cleanliness particularly important?)
- Wann ist für Sie Ihre Wohnung nicht mehr sauber? (At which stage is your home not clean anymore?)

Oberfrage (main question):

- Welche Textilien waschen Sie regelmäßig? (Which clothes do you wash regularly?) Welche Waschmittel benutzen Sie in der Regel? (Which detergents do you use?) Warum diese? (Why especially these?)

Unterfragen (sub-questions):

- Wie zufrieden sind sie mit dem Waschergebnis? (How satisfied are you with the cleaning performance?)
- Welche Temperatureinstellungen nehmen Sie vor? (Which temperature do you use?) Warum? (Why?)
- Wie behandeln Sie Flecken? (How do you treat stains?)

#### **IV. Externe Dimension (external dimension)**

##### **1. Nutzung externer Kommunikationskanäle (external communication)**

Oberfrage (main question):

- Wie und wo informieren Sie sich über Technik? (How and where do you receive information about technology?)

Unterfragen (sub-questions):

- Welche Rolle spielen Produkttests? (Which role do consumer product tests play?)
- Welche Rolle spielt der Händler? (What is the role of the retailer?)
  - Welche Medien nutzen Sie? (Which media do you use?)
  - Sind Sie Mitglied in einem sozialen Netz (Facebook)? (Are you a member of a social network?)

##### **2. Einstellung zu Life-Style/Mode/Kleidung (perception of life-style/fashion)**

Oberfrage (main question):

- „Kleider machen Leute“, was halten Sie von der Aussage? (“Fine feathers make fine birds”: how do you feel about this saying?)

Unterfragen (sub-questions):

- Wie wichtig ist Ihnen Mode? Why? (How important is fashion and dressing for you. Why?)
- Was ist Ihnen beim Kauf von Kleidung wichtig? (What is important when you buy clothes?)
- Haben Sie ein Lieblingskleidungsstück? (Do you have a favourite garment?) Wie kommt das? (Why?)
- Wann geben Sie eine Bluse in die Wäsche?
  - Nachfrage: Wann würden Sie eine Bluse als schmutzig bezeichnen? (When do you consider a blouse as dirty?)
  - Nachfrage: Wann würden Sie eine Bluse als sauber bezeichnen? (When is it perfectly washed and clean?)

## **V. Aktivitäten der Wäschepflege (activities of doing the laundry)**

### **1. Prozess der Wäschepflege (process activities of doing the laundry)**

Oberfrage (main question):

- Wie pflegen Sie Ihre Kleidung? (How do you care for your clothes?)

Unterfragen (sub-questions):

- Wie gehen Sie an einem Washtag konkret vor? (Please explain in detail: how do you do the laundry?)
- Womit starten Sie, wie geht es dann weiter und wie ist der Tag beendet. (How do you start your washday, how do you continue, and what makes the activity complete?)
- Wie sortieren Sie die Kleidung? (How do you sort your laundry?)
- Welche Programme nutzen Sie meistens? (Which programmes do you use?)
- Wie geht es nach dem Waschen weiter? (How does the washing process continue? )
- Wie behandeln Sie hartnäckige Flecke? (How do you remove stains?)
- Wie trocknen Sie? (How do you dry?)
- Wie und wo bügeln Sie? (How and where do you iron?)
- Wie lange dauert der Prozess gewöhnlich (How long does it usually take?)

- Wie gehen Sie bei Ihrem Lieblingskleidungsstück vor? (How do you wash your most favorite clothes?)
- Was geben Sie in die Maschine, was waschen Sie per Hand, was geben Sie in die Reinigung? (Which items do you wash in the machine? Which items are washed manually and which do you take to the dry cleaner, and why?)

## **2. Zufriedenheit mit aktueller Waschmaschine (satisfaction with current features and appliance)**

Oberfrage (main question):

- Wie zufrieden sind Sie mit Ihrer aktuellen Waschmaschine? (How satisfied are you with your current washing machine?)

Unterfragen (sub-questions):

- Wie kommt das, dass Sie da so zufrieden sind? (Why are you satisfied?)

## **3. ‚Wichtigkeit‘ von technischer Ausstattung bei aktueller Waschmaschine (relevance of features)**

Oberfrage (main question):

- Was ist Ihnen bei Ihrer aktuellen Waschmaschine wichtig? (What do you consider as important at your current washing machine?)

Unterfragen (sub-questions):

- Was ist Ihnen bei einer WM am wichtigsten? (What is most important?)
- Worauf könnten Sie verzichten? (Which feature is not necessary?)
- Was könnte man besser machen? (What could be improved? What is missing?)

## **Aufstellort Waschmaschine (location of washing machine, socio-technical arrangements)**

Oberfrage (main question):

- Wo steht denn ihre Waschmaschine? (Where do you locate your washing machine?)

Unterfrage (sub-questions):

- Haben Sie schon mal daran gedacht die WM in die Küche/Bad/Keller zu stellen? (Have you considered to relocate the machine to the kitchen/bathroom/cellar?) Warum (nicht)? (Why or why not?)

***Bitte zeigen Sie mir nun mal wie Sie Wäsche waschen und die Maschine bedienen (Please show me how you do your laundry and where the machine is located)***

**VI. Praktischer Teil (Waschdemonstration direkt am Gerät)  
(practical part, laundry demonstration in front of the machine)**

**1. Start**

- Wie häufig waschen sie ungefähr pro Woche? (How often do you wash per week?)

**2. Prozessschritte (procedures/process activities)**

Oberfrage (main question):

- Bitte zeigen Sie mir mal, wie Sie die WM in Betrieb nehmen und füllen den Wäscheposten ein. (Please show me how you start the machine and fill in the laundry)

Unterfragen (sub-questions):

- Worauf achten Sie beim Beladen? (What needs to be considered when you load the machine?)
- Nehmen Sie eher große oder eher kleine Mengen? Wie kommt das? / Wonach entscheidet sich das? (Do you take a full load or smaller loads? How do you separate the clothes, how do you decide that?)
- Wie sind Sie mit der Handhabung zufrieden? (How satisfied are you with the user interface?)
- Wenn sie an die Bedienung denken, was wünschen Sie sich da anders? (When you look at the user interface, what could be improved?)
- Wie gefällt ihnen die Schriftgröße, Programmbezeichnungen, etc. (How do you like the readability of the programmes, programme wording etc.?)
- Wie verständlich sind für Sie die Programmbezeichnungen? (How clear is the programme wording?) Was heißt eigentlich „Pflegerleicht“? (What does it mean: “easy-care“?)
- Auf welche Programme können Sie verzichten? Warum gerade diese? (Which programmes are superfluous or not used, and why?)

- Warum steht das Gerät auf einem Sockel? (Why do you place the machine on a plinth?)
- Wie sind Sie mit der Optik zufrieden? (How do you like the design?)

### **3. Verbesserungspotentiale Wäschepflege (suggestions for improvements)**

Oberfrage (main question):

- Kamen Ihnen zu Ihrer Waschmaschine schon mal so Gedanken wie: Das könnte doch jetzt besser oder praktischer gemacht sein... (Have you thought about improving the washing machine and in which areas?)

Unterfragen (sub-questions):

- Wenn Sie an die Tätigkeiten des Wäsche waschens denken, was stört Sie? (When you think about your washday, what do you dislike)
- Wann ist das Wäsche waschen das letzte Mal bei Ihnen schiefgelaufen? Und woran lag das? (What went wrong the last time you washed?)
- Was fehlt an Ihrer Maschine? (How do you feel about the appliance; what is missing?)
- Was könnte man besser machen? (What needs to be improved?)

*Ggf. jeweils nachfragen, warum? (further asking: why?) .*

## **VII. Abschluss (closing)**

### **4. Zukünftige Wohnsituation (Perception of ageing-in-place in the future)**

- Wie und wo möchten Sie im Jahr 2020 leben? (How and where do you want to live in 2020?)
- Haben Sie Vorschläge wie man Hausarbeit vereinfachen kann? (How should housework be made easier?)
- Was glauben Sie: wie erledigen Sie dann die Hausarbeit? (What do you think how do you do the housework then?)
- Wie waschen Sie dann die Wäsche? (What do you imagine: how do you do the laundry then?)

### **5. Pläne/Wünsche (wishes/desires)**

- Was sind Ihre Pläne in der Zukunft? (What are your plans for the future?)
- Stellen Sie sich vor, Sie hätten drei Wünsche frei? Welche Wünsche würden sie sich gern erfüllen? (Please imagine, if you had three wishes, which one would you choose?)

### **Anfrage (requests)**

Verschmutztes Hemd mit Flecken präsentieren (Presentation of shirt with stains)

Würden sie dies bitte versuchen einmal zu waschen? (Would you please try to remove the stains until the next interview). Wir werden dann darüber sprechen wie Sie vorgegangen sind. (We will then talk about the ways how you managed it)

### **Zum Schluss (finally)**

- Wie kommt es eigentlich, dass Sie an der Befragung teilgenommen haben? (Why did you take part in this interview?)
- Kennen Sie jemanden der ebenfalls gern an dieser Studie teilnehmen möchte? (Do you know somebody how would like to take part?)

## A9) Contextual interviews: Transcript (example)

Table 54: Contextual interviews: Transcript (example)

5	01:08:24-6	B1	Would you say that something like that would be interesting for you?
5	01:08:32-1	IP1	No, not for me. I am quite old fashioned in that relation. I AM REALLY AFRAID OF A NEW WASHING MACHINE. I ALWAYS TELL MY MACHINE. "Girl, please keep on going for a long, long time. I can't cope with a new one." (bangs on something with a metallic sound). (Laughs). Yes, it is really like that. I have heard it quite a lot, even in my sports club that some of the people needed a new washing machine, and they are people who can cope with a computer, they know what a Cloud is, I mean, I know what that is, too, but I couldn't work with such a data cloud. But they work with it. And they have got problems with the new washing machine, too. Because, once they programmed the machine, they couldn't change it again.
5	01:09:27-3	B1	I would say they have....
5	01:09:28-7	IP1	"I HAVE TO SAY THERE SHOULD BE THE POSSIBILITY FOR THE NEXT GENERATION OF WASHING MACHINES TO TELL THE MACHINE: 'NO, YOU DO IT AS I WANT AND NOT AS YOU WANT!'"(bangs on something with a metallic sound)

## A10) Contextual interviews: Informed consent (example)

### Letter for informed consent (page 1 and 2)

Staatlich anerkannte, private  
**Fachhochschule des  
Mittelstands (FHM)**



Ravensberger Str. 10G, 33602 Bielefeld

Tel. [REDACTED] (contact: Prof.Dr.Lentz)

Olaf Dietrich

[REDACTED]

[REDACTED]

[REDACTED]

*Dear participant,*

*My name is Olaf Dietrich, I am the person responsible for the study and conduct a survey of activities related to the daily housework. I am a research student of the University of Gloucestershire (Great Britain) which has a cooperation with the Fachhochschule des Mittelstands in Bielefeld.*

*I herewith request your consent to collect audio and video recordings of interviews. The following provides various information on the interview. The knowledge gained herefrom is intended to provide insights which could support in the future development of domestic household appliances. You are welcome to invite another person of your trust to attend the interview if you so wish.*

*The study will subscribe throughout to the provisions of data protection legislation. It will involve recording interviews with yourself and will include interview transcribing personal data which will be stored both digitally and on paper. Personal data will be anonymised before being made available to third parties in the form of evaluations. All data will be kept private and secret in the researcher's private home office, which will be locked in absence. The University of Gloucestershire faculty research ethics panel has approved this study.*

## APPENDICES

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*Once the study has been finished the findings will be presented at academic conferences, workshops and published in academic journals. When the findings are published, no participant will be identifiable by name.*

*Your consent is purely voluntary and there will not be any disadvantages resulting from not participating. Similarly, your consent can be withdrawn at any time and you may at all times demand that your person data be deleted. In this event, any data collected thus far may be used in an anonymised manner if this is deemed necessary in the interest of guaranteeing the above-mentioned research objectives. I will keep the data three years after the study has been finished. After three years the data will be destroyed.*

*If you would like to participate in this project, please read and sign the informed consent form and return it together with the complete questionnaire (see attachment).*

\_\_\_\_\_ Place, Date \_\_\_\_\_

Signature

\_\_\_\_\_

Printed Name

*Please contact Prof.Dr. Lentz (Tel. [REDACTED], Dean of the Fachhochschule des Mittelstands in Bielefeld, if you have any concerns regarding this study.*

## Letter for informed consent (page 3)

	<b>Informed consent form</b>	
Study (working title)	Daily housework	
Principal investigator	Olaf Dietrich [REDACTED]	
Do you understand that I have asked you to participate in a research study?	Yes	No
Have you received a copy of the attached information letter?	Yes	No
Do you understand that you are free to refuse participation, or to withdraw from the study at any time without consequences at your request?	Yes	No
Do you understand that the researcher will keep your data confidential? Do you understand that no one will have access to the data apart from the researcher?	Yes	No
Do you understand that you are welcome to invite another person of your trust if you so wish?	Yes	No
Do you understand that you are free to contact the researcher to take the opportunity to ask questions and discuss the study?	Yes	No

## **A11) Expert interviews: Topic guide**

### **1. Allgemein (Hintergründe zum Beruf bzw. zur aktuellen Tätigkeit) (generell: background information about current profession)**

- Wie ist es dazu gekommen, dass Sie sich mit dem Thema „Alter und Technik“ beschäftigen? (ggf. individuell anpassen) (What are the reasons that you are involved in the field of “ageing and technology”?)
- Welche eigenen Erfahrungen haben Sie persönlich mit Technik gemacht? (Which experiences have you personally made with technology?)
- Wie würden Sie Ihre Einstellung zu neuen Technologien bezeichnen? (How would you describe your attitude towards technology?)
- Um was geht es in Ihrem Projekt, was sind die Ziele und die Inhalte? (What is the main content of your work?)
- Warum gerade dieses Thema? (Why this particular field?)
- Bitte beschreiben Sie kurz Ihre ersten Erfahrungen in der Umsetzung. (What are your experiences with technology for older adults?) Welche Herausforderungen stellen sich in der Umsetzung? (Which challenges do you face in the implementation of new technology in the homes of the older adults?)

### **2. Selbstbestimmtes Leben (perception of independent living)**

- Was verstehen ältere Menschen unter selbstbestimmten Leben? (What do older people understand of independent living?)
- Wie würden Sie die Lebensqualität von älteren Menschen aus Ihrem Umfeld (Projekt) beschreiben? (How would you describe the living situation of older people in your professional environment?)
- Welche Probleme treten mit zunehmendem Alter auf? (Which problems do occur in later life?)
- Wie kann eine Früherkennung funktionieren? Wie sollte man vorbeugen? (How can prevention work?)
- Wie kann die Lebensqualität verbessert werden? Wie kann man das Wohlbefinden verbessern? Wie kann man die Lebensfreude steigern? (How can the quality of life be enhanced? How can well-being be enhanced? How can the joy of life be enhanced?)
- Welche Bedeutung hat körperliche Aktivität, Fitness? (Which role does physical activity/fitness play?)
- Welche Rolle spielt „lebenslanges Lernen“? (What is the role of “lifelong learning”?)

- „Kleider machen Leute“, was halten Sie von der Aussage, welche Rolle spielt Kleidung für das Wohlbefinden von älteren Menschen? (There is a saying: “fine feathers make fine birds”: What do you say about this statement? How important are clothes for the well-being of older people?)
- Wie kann man Altersisolation vorbeugen, entgegenen? (How can ageing isolation be avoided?) Soziale Kontakte fördern? (How can social contacts be supported?) Wie kann man diese Menschen motivieren? (How can we motivate these people?) Wie kann man Zugang bekommen? (How can we get access?)

### **3. Wohnsituation (living situation, ageing-in-place)**

- Welche Bedeutung hat das eigene Heim für ältere Menschen? (Which importance does the own home have for older people?)
- Warum wollen ältere Menschen so lange wie möglich Zuhause wohnen bleiben? Was sind typische Gründe? (Why do older people want to stay as long as possible in their homes? What are typical reasons?)
- Was sind die erlebten Barrieren im eigenen Zuhause? (What are experienced barriers in their homes?)
- Ab wann ist es besser in ein betreutes Wohnen, in ein Pflegeheim überzugehen? (When is it better to go to a day care centre/an assisted living facility?)
- Manche ältere Menschen bevorzugen eher im Ausland zu leben, zumindest zeitweise. Was halten Sie von diesem Trend? (Some older people prefer to stay, at least temporarily, abroad in a foreign country? What do you think about this trend?)

### **4. Selbstständige Durchführung von Hausarbeit (independent conduct of tasks)**

- Welche Haushaltstätigkeiten haben für ältere Menschen einen besonders hohen Stellenwert? (Which domestic tasks are important for older people?)
- Gibt es Tätigkeiten, die ältere Menschen im Haushalt nicht mehr so gut ausführen können? (Which domestic tasks are getting harder in later life?)
- Welche Voraussetzungen müssen geschaffen werden, damit ältere Menschen möglichst lange im eigenen Zuhause leben können? (What are the prerequisites of staying at home?)
- Welche Rolle nimmt die Technik zur Unterstützung der Lebensführung ein, wo gibt es Grenzen? (Which role does household technology play to support this?)

**5. Einflußfaktoren auf Techniknutzung (dimensions and determinants influencing usage patterns of technology)**

- Was ändert sich nach dem Ruhestand? Welche Rolle spielt die Hausarbeit dann? (What changes after retirement? How does housework change?)
- Welchen Tätigkeiten im Haushalt sind eher mühsam? (Which activities are difficult to accomplish?) Wo wird Hilfe, Unterstützung benötigt? (Where is support required?) Wie kann so eine Unterstützung aussehen? (How can this support look like?)
- Über was ärgern sich ältere Menschen, wenn es um Technik geht? (Which topics annoy older people?)
- Was ist älteren Menschen bei Haushaltsprodukten wichtig? (What is important for older people when it comes to household products?) Welche Eigenschaften sollten Haushaltsprodukte besitzen? (Which features should appliances have?) Was darf fehlen? (What can be taken out?)
- Bei einer Neuanschaffung von Haushaltsprodukten (z.B. Waschmaschine): Welche Rolle spielt Qualität, Preis, Bedienkomfort, Service, etc.; was dominiert? (When you consider the next purchase of a new appliance, which role does quality, price, convenience, service etc play? What is the most important point?)
- Was glauben Sie, warum spielen energieeffiziente Geräte so eine große Rolle bei der Kaufentscheidung? (Why are energy efficient appliances so important?)
- Was ist noch wichtig bei einer Neuanschaffung eines technischen Produktes? (What else is important for older people?) Worauf müssen Designer und Produktentwickler im Vorfeld achten? (What needs to be considered by a designer and product manager?)
- Worauf müssen Händler bei der Beratung achten? (What needs to be considered by a retailer?)
- Welche Rolle spielen Neue Medien für ältere Menschen, wenn es um Produktinformationen geht? (Which role does new media play for elderly people to gather product information?)
- Sollte man Routinen bei Tätigkeiten überhaupt verändern? (How should routines be changed?) Unter welchen Voraussetzungen sind ältere Menschen bereit ihre häuslichen Routinen zu ändern und Neues zu lernen? (Under which conditions are older people willing to change routines?) Was sind Ansatzpunkte? (What are approaches?)

**6. Selbständiges Leben durch Technik und Neue Medien (technological dimension to support independent living)**

- Wie kann Technik im häuslichen Umfeld helfen, unterstützen? (How can technology support in daily life?)
- Was ist „hilfreiche Technik“ im Wohnumfeld? (In which areas can assistive technology help in the living environment?)
- Was halten Sie von AAL, SmartLiving? (How do you see smart living concepts?) Warum hat sich dies noch nicht durchgesetzt, was ist Ihre Meinung hierzu? (Why is this still not implemented enough in the homes?)
- Kennen Sie das SmartSeniorProjekt? Wenn ja, was halten Sie davon? (Are you aware of the SmartSenior project? If yes, what do you think about it?)
- Wie kann man Ängste und Barrieren gegenüber neuen Medien abbauen? (How can technology acceptance be enhanced and how can the fear to use technology be reduced?)
- Was halten Sie von Telemedizin, z. B. die Übermittlung von Vitaldaten (Blutdruck, Puls) per Internet? (What is the benefit and purpose of telemedicine from your point of view?)
- Intervention mittels Technik, z. B. Sensoren im häuslichen Umfeld, die Bewegungsmuster erfassen und einen Alarm auslösen z. B. bei einem Sturz? (Intervention through technology, e.g., sensors in the living environment, alarm systems etc?)
- Präventive Früherkennung mittels Sensoren im häuslichen Umfeld, permanent Erfassung von Vitaldaten z. B. im Sessel? (How do you see the implementation of smart technology to measure vital data?)
- Andere Interventionen z. B. Roboter, SmartWatch. (Other means of intervention e.g., smart watch, robot cleaner?)
- Was halten Sie z. B. von einem Robotsauger, der auf Knopfdruck einen Teil der Reinigung im Haus (oder Garten) übernimmt? Körperliche Anstrengung, lästiges Bücken entfällt. Es ist auch eine Entlastung für Angehörige. (What do you think about a robot cleaner or a lawn mower which takes over part of the garden work? Physical effort could be reduced, also it is less work for relatives)

## 7. Ausblick (outlook)

- Was denken Sie, sind die wichtigsten Themen, die noch angepackt werden müssten? (What are the most important areas that need to be approached?)
- Wie wird die Situation in 10 Jahren aussehen? Welche Initiativen haben sich dann durchgesetzt? (How should the situation look like in ten years? which initiatives will prevail?)
- Was halten Sie von alternativen Wohnformen? (What do you think about alternative forms of living?)
- Wie sieht die alltägliche Hausarbeit einer 75-jährigen Dame/Herrn in 2025 aus? (How does housework look like in 2025 for a 75-year-old lady regarding laundry, ironing, cooking, shopping, etc...)
- Welche Projekte müsste die Industrie starten? (Which projects need to be started?) Welche Produkte sollten entwickelt werden, unabhängig von der technischen Machbarkeit? (Which products should be developed?)
- Welche Rolle können Ehrenämter spielen? (What will be the role of community-ship, voluntary work in the future like peer-to-peer support)

## A12) Expert interviews: Transcript (example)

**Table 55: Expert interviews: Transcript (example)**

16	00:24:11-9	IP1	Well. I inform myself via Internet. But most people at my age don't do that. The younger generation does it more intensive, maybe. I watch something on TV and I think: "Well, I could purchase that." But I am maybe not the right partner. I mean, I can afford a lot which others can't afford and so I act in a different way.
16	00:24:53-4	B1	Nevertheless, with your experience, I have led a lot of conversations and one thing that always played a major role was that energy-efficient devices are very important for the elderly people. That was surprising to me. What do you think, why is it like that?
16	00:25:10-2	IP1	Well, yes, I think, if the energy prices rise higher, then it plays a major role. The problem is if you really can cope with that problem. After the last remarks from the field of economy, I think for example of Professor Sinn, the energy prices will rise by the factor 14 and what will happen then? Nobody will take part in that, there will be a revolution.
16	00:25:48-6	B1	Do you believe, and that is my interpretation, that it has to do with the biography, the way a person grew up, at times where the resources were tight. So they continue it that way:
16	00:26:04-7	IP1	Yes, that plays a role between the generations. The older generation, that's us, we had to be thrifty. We men of my generation, if we bought a pair of shoes they had to last ten years. Well, we men of my generation we have never taken part in this fashion thing. That was out of question for us. A thing was used as long as possible and we cared for it up to a point where no more is possible. The new generation is the modern purchaser. Policy has moved from a user to a consumer. The ministry is even called ministry of consumption. We have changed to a throwaway society. It is going to be hard for us, this throwaway society. There will be very high costs and they will try to stop this development by rising the prices and the labour costs. But as we all know the labour costs are not going to rise as much as the prices will. And then dissatisfaction will arise, for sure.
16	00:27:41-7	B1	Mr. XY, just one question concerning household routines: Do you think that you can change the habits of elderly people at a certain age?
16	00:27:57-4	IP1	Yes, slowly. They can get used to it. But I think, we recognize this, let's say, when talking about the computer, a typical example. I remember, when I was still working, that my boss, he was 80, retired, and had never used the computer so far. I taught it to him and he was very pleased and accepted it. Just in a simple way, he just wrote down his birthdays and wrote his letters, but he was happy with it. So that is one example...But if you try to teach the computer to an older generation, you have to be practical. I led a computer course to get elderly people used to it. Imagine the following: There was a farmer, I showed him something about computers. "Well, that doesn't interest me." He is not interested. So I ask him a question. What does he need? What is he thinking about at the moment, what does he want to have? Then the farmer tells me: "I could really need a tedder." So and then I go into the internet, use Google, type in 'tedder' and suddenly he sees a huge table with possibilities and information. He couldn't imagine such a thing and in such a moment there is the contact with the medium and interest is awoken.
16	00:29:43	B	Yes, that is a nice example. I like it very much, Mister...
16	00:29:53-9	IP1	You have to treat the older generation in such a way, praxis-oriented. To explain certain operating systems, how Word or Excel are built up, that is not important. It is important what the individual person wants. One likes to paint, the other one wants to register his photos, so you have to build up the courses like this.

## A13) Focus groups with older adults: Topic guide

### Guideline for focus groups: Topic housework

#### 1. Framework conditions

Number of focus group:	1 group of 6-8 persons
Materials:	<ul style="list-style-type: none"><li>▪ 8 cardboards, 5 are presented one after another</li><li>▪ 8 x laminated papers</li><li>▪ 9 sheets of paper with blue/green cards</li><li>▪ pens</li><li>▪ scissors</li><li>▪ ball pens</li><li>▪ cards</li><li>▪ glue</li><li>▪ pins</li><li>▪ “dirty shirt“ with stain (ketchup/mustard)</li><li>▪ information sheet (10x)</li><li>▪ attendance certificate (20x)</li><li>▪ Canon camera</li><li>▪ video camera</li><li>▪ tape recorder</li><li>▪ alarm clock and “cloud”: “welcome“, “rules“, “housework – what is important to you?“</li></ul>

**a) Introduction (10 min. → 00:00 – 00:10)**

<b>Aim:</b>	<b>Warm-up: Clarification of framework conditions, attendance certificate and conversation rules</b>	
<b>Topic</b>	<b>Content:</b>	<b>Method/Technique/Notes:</b>
Welcome/ Greeting:	<ul style="list-style-type: none"> <li>▪ Introduction of moderator and co-moderator</li> <li>▪ Background information about the research: academic work about the topic 'housework'</li> <li>▪ Identification of possibilities to make housework easier. I am interested in what has changed for you throughout the years. Therefore your experiences and opinions are important. I would like to discuss that in this group.</li> </ul>	Note: Welcome
Information about data privacy and attendance certificate:	<ul style="list-style-type: none"> <li>▪ To inform about the topic data privacy; information sheet about the confidentiality and data protection. Note: Personal data will be collected, but are treated confidentially and anonymously. They will be destroyed later.</li> <li>▪ Information and agreement to record on tape. Information and agreement that assistant is going to take photos.</li> <li>▪ Privacy statement and attendance certificate. To be signed. Hand out copy to take home.</li> </ul>	Note: Moderator keeps quiet
Framework conditions:	<ul style="list-style-type: none"> <li>▪ Group discussions: last about 1,5 hours to 2 hours</li> <li>▪ no break, mobiles must be switched off</li> <li>▪ Food and drinks are available (at any time)</li> </ul>	
Conversation rules	<ul style="list-style-type: none"> <li>▪ Each opinion is important and valuable</li> <li>▪ No criticism, there are no right or wrong answers.</li> <li>▪ It is not the goal to reach a group opinion</li> <li>▪ Reactions to statements of other participants are wanted</li> <li>▪ Do not interrupt and speak loud enough</li> </ul>	Moderator writes the rules on a paper and makes them visible for everyone. They are hung up
Round of introduction	<ul style="list-style-type: none"> <li>▪ name, first name, age, family status, household size, job</li> </ul>	Name tags are put up

**b) Introduction into the topic (20 min. → 00:10 – 00:30)**

Aim:	Getting to know overall habits in the housework, identification of priorities and problems	
Topics:	Questions:	Methods/Technique/Notes:
Overall habits in the housework 10 minutes	<ul style="list-style-type: none"> <li>▪ I would like to know something about your habits</li> <li>▪ Please tell me who does the housework in your household?</li> <li>▪ Which activities do you do?</li> <li>▪ Which activities are more laborious? Which activities do you enjoy?</li> <li>▪ Who taught you that?</li> <li>▪ What was a washday like in former times? What is it like today?</li> </ul>	Addressing of participants, not everybody, just some “Stains” (if it is too tedious, open question: “How would you wash that?”)
Questioning priorities: 3 minutes	<ul style="list-style-type: none"> <li>▪ Please tell us about your priorities in housework? What is important for you? You get two pieces of paper with 4 contrary statements stucked on.</li> <li>▪ Please decide either for or against a statement on a blue or green card. The statement you prefer most, stays on the paper. The statement you disagree with must be detached.</li> <li>▪ In the end 4 statements are left on each paper.</li> </ul>	Distribution of papers, detachment of cards.
Discussion of priorities: 7 minutes	<ul style="list-style-type: none"> <li>▪ Please explain shortly your decision for your cards and why you have decided for this special card.</li> </ul>	Each participant explains shortly his/her choice in front of the group Assistant pins the results on a pin board, around a cloud “Housework – what is important for you?”

**c) Presentation of concepts (60 min. → 00:30 – 01:30)**

<p><b>Aim:</b></p>	<p><b>Plausibility checks of five personas/ user scenarios and creation of first ideas to solve problems. Collection of spontaneous comments on a presented solution</b></p>	
<p><b>Topic:</b></p>	<p><b>Questions:</b></p>	<p><b>Methods/Technique/Notes:</b></p>
<p><b>10 minutes pro persona/ scenario</b></p> <ul style="list-style-type: none"> <li>Introduction of the personas and the user scenario = Introduction of the persona one by one by moderator (takes notes of spontaneous feelings/ideas)</li> <li>Presentation and evaluation of the solution idea (laminated paper)</li> </ul>	<p>1. Introduction of the persona/ problem: In how far is this identical with your experiences? Do you know such a situation?</p> <p>2. Do you have a sponaneous solution? Please write your idea on a card. What would you suggest? (notes)</p> <p>3. Presentation of a solution: a) Spontaneous technology evaluation: Please comment on this solution. What do you think about this technology? Is this rather a revolutionary innovation or an unimportant change?</p> <p>b) Advantage argumentation from the persona's point of view: What do you think about this promise? What is positive? What is rather negative? What makes you sceptical? Why do you think the solution could be helpful for XY? What do you think where are the advantages of this solution for XY? How do you judge the user comfort? The practicability?</p> <p>c) Advantage argumentation from the participants' point of view: Which advantages could that have for you? What should be done better? Which statement is the most important and relevant for you personally? Would you use it yourself?</p>	<p>Red cards and pens are handed out to write down ideas/ wishes/ comments</p> <p>Presentation of the cardboards, first without a solution, comments on the persona, spontaneous remarks. Participants write down their comments on cards and talk about them while the cards are attached to a pin board.</p> <p>Ideas for a solution (laminated paper) are explained by the moderator and stuck on the cardboard.</p> <p>Moderator writes down the notes on cards and sticks them to the solution</p> <p><b>In the end the cardboard is hung up onto the wall in the end</b></p>

## A14) Focus groups with older adults: Transcript (example)

**Table 56: Focus group: Transcript (example)**

10	00:57:13-3	IP8	“Yes, I have got a question. Washing machines seem to last quite long. Some have the reputation to last about 25, 30 years, maybe. Now you are 79 years old and you spend about 1000 Euros for such a high-performance product. Is it still worth spending 1000 Euros? Is it really worth it? According to my life expectancy? Do I need the machine, thinking like a ‘Lipper’ ( <i>remark: local expression about stingy people</i> )? Many are going to say that there might be something cheaper, who knows if I still can experience it. I haven’t spent so much money then, have I?”
10	00:57:52-3	IP1	But this small machine isn’t much cheaper and you don’t have to pay so much for a machine.
10	00:58:00-0	IP4	I don’t know how long I am going to live.
10	00:58:01-3	IP2	Yes, that’s it.
10	00:58:03-1	IP6	And above all, it could happen that you have to go to an old people’s home. Then you do not need a washing machine anymore. When you are old.
10	00:58:15-9	IP4	Yes, you don’t have to be old today, it can also happen to you in younger years, that you have to go to a home. “
10	00:58:23-7	IP7	Well, if you think like that then you needn’t buy anything anymore. If you think like that....
10	00:58:26-9	IP5	Well, I modified my garden a short time ago, and afterwards I said to myself: Even if I only had one week to live to look outside the window, and to see how beautiful my garden is, then I wouldn’t care. At least I had one week to enjoy it (laughs)
10	00:58:39-7	B1	There is one solution. That is one idea. Christel bought a very economical mini washing machine. This small washing machine has a load size of max. 3 kilos and is ideal for the daily washing, for example two blouses, quickly washed inbetween. The machine is very compact, is 40 cm deep and very light, 20 kilos, and can be placed on a kitchen table or can be hung up on the bathroom wall. Then Christel doesn’t have to bend down. The machine has got an important advantage: Christel doesn’t have to go down to the cellar for one or two pieces of laundry. The machine is already on the market.
10	00:59:19-9	IP5	Is there something like this?
10	00:59:20-8	IP7	Such a small one?
10	00:59:21-8	IP5	I didn’t know that.
10	00:59:22-8	B1	It hangs on the wall, you can install it on a wall. What are your spontaneous reactions on this? A machine that can be mounted on the wall?
10	00:59:41-2	IP4	But I have to wash so often then.
10	00:59:43-3	IP2	Always just 3 kilos? There has to be a supply of water, somehow.
10	00:59:47-1	IP4	Yes, you have to have a device construction, the water taps, and there has to be a drain for the water.
10	00:59:51-7	B1	Everything is there. It is a real washing machine.
10	00:59:54-0	IP4	It is a real one? Well, first I have to have a water connection and the drain of the washing machine...
10	00:59:58-7	B1	Just like a dishwasher.
10	00:59:59-6	IP7	That all has to be installed before you purchase such a machine.

## A15) Focus groups with older adults: Determinants

Table 57: Focus groups: Determinants

	Images	Skills	Objects
Household social context	Supportive family members and peers help to adopt new technology	High communication intensity within family	User can discuss with family members who demonstrate product use
	Fear of being a burden	Lack of explanation	Lack of support by family, neighbors to adopt technology
Technological dimension	<p>“Autonomy-enhancing”</p> <p>Smart technologies as a means to counter stigmatization (being frail, old fashioned)</p> <p>Hedonic motivation</p>	<p>Want to keep control over technology</p> <p>Automatic programmes are convenient</p>	Cohesion of complementary products (drying and washing belong together)
	<p>Dryer seen as wasted energy; not used or only in ‘emergency situations’,</p> <p>Hand wash still very common</p>	<p>Want to stick to the familiar technology</p> <p>Strong concerns regarding loss of control</p>	<p>Price value (perceived as expensive)</p> <p>Too many complex functions and features are rejected</p> <p>Covert resistance</p> <p>Installation concerns</p> <p>Technology fails to perform as expected, digital maintenance</p>
Personal dimension	<p>Prefer “fresh, clean laundry”</p> <p>“Doing the laundry is perceived not a problem anymore”</p> <p>Experiences of formative time shape image of practices.</p> <p>High standards in cleaning (“meticulous identity”)</p>	<p>Disruption in social life changes behaviour, learning of new skills</p> <p>Life course changes have a major impact</p> <p>One’s belief to be able to cope with technology</p>	<p>“Not for me anymore”, something for a “younger generation” (life course perspective)</p> <p>Biographic influences: saving energy, money is important</p>
	<p>High emotional attachment to home.</p> <p>To keep current structures is desired.</p>	<p>One’s belief to be not able to cope with technology, “learned helplessness” (not trying anymore)</p> <p>Indifference to new technology</p>	Adaptability of technology to new life situation. Lack of perceived usefulness
External dimension	<p>High degree of brand loyalty</p> <p>Concepts of freshness (in doing the laundry)</p>	<p>Strong influence of habits and routines</p> <p>Shared conventions</p> <p>Cooperation, joint inquiry in research methods required</p>	<p>Provide a ‘good instruction manual’</p> <p>Special media channels (test reports)</p>
	Low trust eco system (retailer)	Companies neglect demands of older adults	Use of complementary products due to external influences (e.g., weather)

## A16) Focus group with experts: Topic guide

### a) Introduction (10 min. → 00:00 – 00:10)

Aim: Warm-up: Framework conditions, participation conditions, game rules		
Topic:	Content:	Method/Technique:
Welcome:	<ul style="list-style-type: none"> <li>▪ Moderator introduces himself</li> <li>▪ Study background: scientific research with the topic Ageing-in-Place and housework</li> <li>▪ Identification of possibilities to simplify housework and to support elderly people</li> <li>▪ Moderator presents 3 approaches/scenarios which should be discussed in the group, especially against the background of the question which marketing concepts should be considered.</li> </ul>	Welcome
Informed consent/ data protection:	<ul style="list-style-type: none"> <li>▪ Information about the topic data protection. There is an information sheet about confidentiality and data protection.</li> <li>▪ Note: Personal data is collected and will be treated confidentially. It will be analysed anonymously. Later it will be destroyed.</li> <li>▪ The moderator is going to record everything on a tape. Photos will be taken.</li> <li>▪ Please read through the information letter and the consent form including privacy statement and sign it. Please keep the copies.</li> </ul>	Note: The moderator keeps quiet.
Framework conditions:	<ul style="list-style-type: none"> <li>▪ Group discussion takes about 1,5 – 2 h</li> <li>▪ No break, mobiles are switched off</li> <li>▪ Food and drinks are available</li> </ul>	
Conversation rules:	<ul style="list-style-type: none"> <li>▪ Every opinion is important and valuable</li> <li>▪ No criticism, no right or wrong statements</li> <li>▪ It is not the aim to reach a group opinion</li> <li>▪ Reactions on statements by other participants are welcome</li> <li>▪ Speak successively, loud enough</li> </ul>	Write everything on cardboard so that it can be seen at any time
Round of introduction:	<ul style="list-style-type: none"> <li>▪ Name, first name, age, family status, household size, professional activity</li> </ul>	Put on name tags

**b) Introduction into the topic (20 min. → 00:10 – 00:30)**

Aim:	Questioning: General perception of ageing	
Topic:	Questions:	Method/Technique:
10 minutes	<ul style="list-style-type: none"> <li>• How do you perceive “ageing“?</li> <li>• How do you want to live when you are old?</li> <li>• What means “life quality“ at old age?</li> </ul>	<p>Speak to the participants.                      Not all of them are addressed, but some                      Notes are taken.</p>
Introduction to the study 10 minutes	<ul style="list-style-type: none"> <li>• 5-6 charts from the presentation</li> </ul>	

**c) Presentation of scenarios (60 min. → 00:30 – 01:30)**

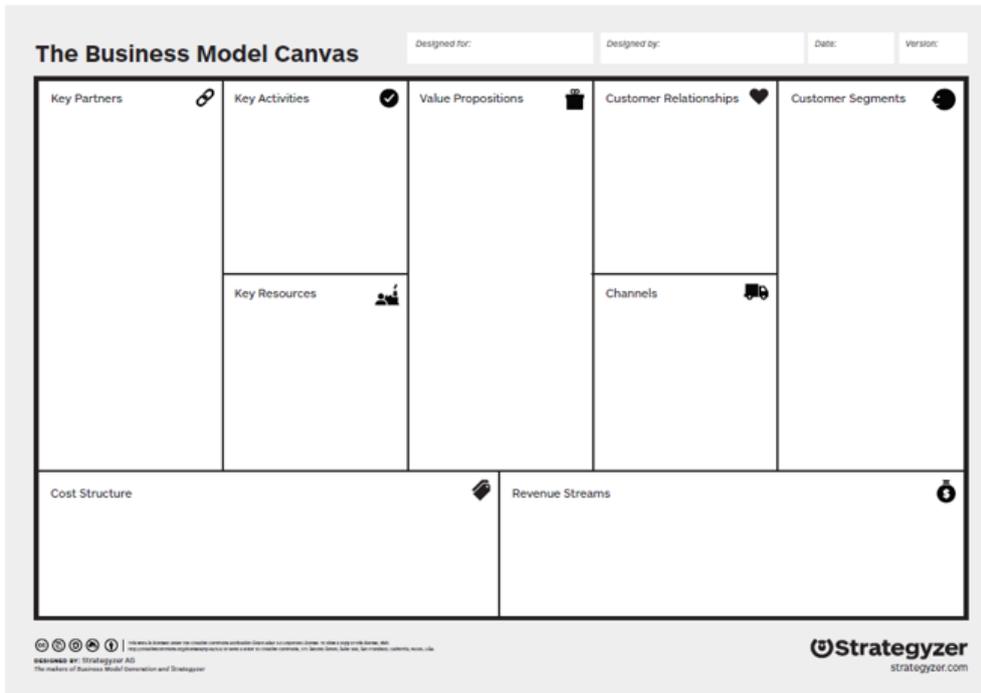
<b>Aim:</b> Plausibility of three personas/ User scenarios and generation of first ideas of business models. Collection of spontaneous comments/impressions of the presented solution		
<b>Topic:</b>	<b>Questions:</b>	<b>Method/Technique:</b>
<p>10 minutes per persona/ scenario</p> <p>Introduction of the personas and the user scenarios = presentation of the personas one after another by the moderator and comments/ spontaneous impressions</p>	<ul style="list-style-type: none"> <li>▪ Introduction of the persona/ problem: What would you recommend (just notes)?</li> <li>▪ Presentation of the solution Do you have a spontaneous idea what you have to consider for a Business Case? Please put down your notes on a card!</li> <li>▪ Please comment on the solution: What is the key value proposition? Do you think this solution is helpful for XY? What do you think: what are the advantages/disadvantages of this solution for XY? How do you judge the operating comfort? The practicality? Which concerns do you have? What has to be made better? Would you consider to use it for yourself?</li> </ul>	<p>Red cards and pens to write down the wishes, ideas, comments</p> <p>Moderator writes down some notes on cards and sticks them to the solution.</p> <p><b>Cardboard will be hung up later on the wall.</b></p>

**d) Concept assessment (15 min. → 01:30 – 01:45)**

Aim: Assessment of the solutions considering the relevance of the customer value proposition		
Topic:	Questions:	Method/Technique:
<p>All three scenarios are hung up next to each other on the wall</p> <p>After all of the personas/scenarios are presented and hung up, the assessment of the scenarios follows.</p> <p>Conclusion</p> <p>Thank you!</p>	<ul style="list-style-type: none"> <li>▪ Which of the concept ideas is the most convincing? Which one is the least convincing?</li> <li>▪ Please choose your favourites:                             <ul style="list-style-type: none"> <li>○ Prioritize the concept ideas regarding                                     <ul style="list-style-type: none"> <li>a) perceived benefit (value proposition)</li> <li>b) perceived ease of use / user comfort</li> <li>c) scalability / feasibility</li> </ul> </li> </ul> </li> <li>• To choose their favourite, the participants have to stick dots onto cardboards:                             <p>You get 5 blue stickers. Please apply max. 3 stickers to your favourite solution. The remaining stickers can be stuck to the other favourites. Please also take notes why this solution is of interest for you. Please make proposals for your favourite if you wish so on the red card. The solution which you completely dislike should be marked with a red sticker. Should you have an improvement suggestion, please write it on a red card and stick it onto the cardboard next to the scenarios.</p> </li> <li>• Group photo with the winner cardboard: “Persona / Scenario“</li> </ul>	<p>Everybody gets 5 blue stickers and red cards</p> <p>Everybody gets one red sticker</p>

# A17) Focus group with experts: Templates and results

Template *Business Model Canvas*  
Original



Osterwalder & Pigneur, 2011

([www.businessmodelgeneration.com/canvas/bmc](http://www.businessmodelgeneration.com/canvas/bmc): business model generator.com)

Results of the workshop from 11th July 2014

<p><b>Supported Practices</b></p> <p>Which practice supports your concepts?</p> <ul style="list-style-type: none"> <li>• Keep company with somebody</li> <li>• Social events (2x), entertainment</li> <li>• Household tasks             <ul style="list-style-type: none"> <li>• Cleaning - flat, laundry</li> <li>• Cooking</li> <li>• Simple household activities (washing up, vacuum-cleaning, window cleaning)</li> <li>• Shopping (2x), transport (2x)</li> </ul> </li> <li>• Escort service to a doctor</li> </ul>	<p><b>Value Proposition</b></p> <p>Why are these offers useful? Which social problem is solved?</p> <ul style="list-style-type: none"> <li>• Easy access - provide "low threshold"</li> <li>• Simplification</li> <li>• Increase social contacts</li> </ul>	<p><b>Satisfied Customers</b></p> <p>For which person is the offer attractive? What is exciting for the customer? Why would he buy it?</p> <ul style="list-style-type: none"> <li>• Specific, personalized offers, services</li> <li>• Huge bandwidth of persons, according to the choice of offers</li> </ul>
<p><b>Independent Lifestyle</b></p> <p>In how far are abilities supported by a practice?</p> <ul style="list-style-type: none"> <li>• Education</li> <li>• Sports/ movement</li> <li>• Keep fit</li> <li>• Financial business</li> <li>• Animal keeping</li> </ul>	<p><b>Your Costs / Your Benefits</b></p> <p>How do you earn money? Is the concept sustainable in the long run? Which factors create costs?</p> <ul style="list-style-type: none"> <li>• Win social organisations as sponsors (deaconry as a responsible body)</li> <li>• Internet / radio (local radio station), flyer at the doctor's</li> <li>• Win health insurance company → rises coverages</li> <li>• Identify the customer journey first</li> <li>• Analyse all customer 'touch points'</li> </ul>	
<p><b>Social Disadvantages/ Costs for society</b></p> <p>Which concerns are there? What has to be improved? Which disadvantages has the society? (relatives, neighbours, health insurances, doctors)</p> <ul style="list-style-type: none"> <li>• Dependency on social sponsors → high costs for overhead</li> <li>• Range → might be too low</li> </ul>	<p><b>Social Advantages/ Benefits for society</b></p> <p>Which advantages does the society have of your concept? , (relatives, neighbours, health insurances, doctors)</p> <ul style="list-style-type: none"> <li>• Involve and talk to children (normally already around 40-50 years old)</li> <li>• Involve and engage the neighbourhood, community !!!</li> </ul>	