

Everyday technology and capabilities in later life:  
experiences of older adults living with mild cognitive  
impairment and subjective cognitive decline in  
Barcelona

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## **Abstract**

Older adults living with cognitive impairment encounter difficulties when engaging with everyday technologies and face social and psychological changes in their daily lives. This study aims to use the capability approach as a heuristic tool to explore the role of everyday technology in later life capabilities. A qualitative methodology was used to interview 16 community-dwelling older adults that were participating in cognitive stimulation activities in Barcelona. Participants were asked to describe how they acquired technology devices currently present in their lives, how was to learn to use these devices and how they carried out valued functionings with them. Results show that older adults living with cognitive impairment evaluate their own capacities and opportunities and execute their agency to manage hardships and to benefit from what technological resources can offer. Using everyday technology in daily life, older adults strived to simplify its use and sought social support from ‘technology experts’ and community centres for older adults to adopt new devices. On life at home, older adults valued the simplification of household tasks and the enablement of domestic activities through a wide range of devices. Motivation and openness to learning new things played a key role in the use of technology in the context of cognitive impairments and it was seen as a strategy for coping with cognitive decline. The results show that everyday technology plays a dynamic role in later life capabilities in the context of changing cognitive capacities and that contextual factors can influence how older adults use technology.

**Keywords:** Everyday Technology, Capability Approach, later life, mild cognitive impairment, subjective cognitive decline, community centres for older adults, memory workshops, Barcelona

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### **List of abbreviations**

BMA: Barcelona Metropolitan Area

CA: Capability Approach

DCC: Day Care Centre

ET: Everyday Technology

MCI: Mild Cognitive Impairment

RCC: Recreational Community Centre

SCD: Subjective Cognitive Decline

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## 1. Introduction

High income societies are experiencing an unprecedented process of population ageing and increasing life expectancy which posits new societal challenges to support the needs of an older population (Prince et al., 2013). It is expected that the share of the population of high-income countries aged 65+ will increase from 17% in 2015 to 26.8% in 2050 (United Nations, 2017). Life expectancy at 65 years old in these countries is expected to increase as well in the same period from 20,4 years in 2015 to 23,2 years in 2050 (United Nations, 2017). These changes mean that a high proportion of the population will have an increased risk of developing some form of cognitive impairment due to advanced age (Prince et al., 2013; Topo, 2009). Living with cognitive impairment negatively affects the capability of older adults to live independently at home and can precipitate the need of long-term if the condition progress to dementia (Førsund et al., 2018). To face this increase in the need of long-term care services, high income countries must strive to provide the social and material structures that facilitate independent living in older adults living with some form of cognitive impairment (Seidel et al., 2010).

Pre-dementia cognitive impairment usually takes the form of mild cognitive impairment (MCI), sometimes preceded by subjective cognitive decline (SCD) (Winblad et al., 2004). MCI and SCD are mental health conditions characterized by a decrease in cognitive function, that exceeds what is expected for the age and educational level of an individual (Petersen & Morris, 2005). These conditions do not impair the ability to carry out basic activities of daily living independently. As a clinical diagnosis, health practitioners detect the existence of MCI through cognitive function tests to define the level of cognitive deficits (Lingler et al., 2006). The presence of cognitive functions complaints along with objectively measured cognitive deficits are the two main criteria used to diagnose MCI. On the contrary, SCD is based solely on the subjective perception of cognitive decline in any domain of cognition over time and does not require the confirmation of its existence through a test (Jessen et al., 2014). This perceived subjective decline has been associated with an increased risk of MCI and dementia (Tandetnik et al., 2015). These conditions are considered as part of a broader continuum of mental health conditions associated with the ageing process, ranging from healthy old age to having a dementia condition (Winblad et al., 2004). A substantial proportion of people living

with MCI remain stable in their condition for long periods of time, but between 10% to 40% of them will progress onto a dementia condition each year, depending on the context (Berg, Wallin, Nordlund, & Johansson, 2013, p. 293). In the Spanish context, it is estimated that 18,5% of the population aged 65 or older lives with some form of cognitive impairment (Vega Alonso et al., 2018). These conditions of cognitive impairment normally do not affect the capacity of an individual to carry basic activities of daily living (Winblad et al., 2004). However, the lived experience of cognitive impairment can be stressful as it generates a mismatch between cognitive capacity and the demands of everyday life and social networks (Berg et al., 2013; Lingler et al., 2006). In turn, the experience of distal stress and loss of social connections can precipitate the progression of cognitive impairment into dementia (Berg et al., 2013).

In this sense, technology is regarded as an important resource to engage independently in everyday life activities for older adults living with some form of cognitive impairment (Cahill, Macijauskiene, Nygård, Faulkner, & Hagen, 2007). For example, Brittain et al. (2010) identified how everyday technologies of place such as road signs, landscaping and landmarks can help older adults living with dementia to manage their feelings of being out of place in outdoor environments. Nygård (2008) concluded that technology can have a practical and existential meaning to older adults living with cognitive impairment, as it helps them to achieve valued goals and to construct their self-images in daily live. However, technological design barriers combined with a diminished cognitive capacity can constrain the capabilities of older adults to actively and creatively use technology for their own needs (Joyce & Loe, 2010b).

Currently, high income countries are characterized by a rapid technological development that constantly transforms the technology that older adults face in their daily lives (Gilleard, 2017; Malinowsky, Kottorp, Patomella, Rosenberg, & Nygård, 2015). Engagement with technology in everyday life is almost impossible to avoid, since technology has permeated every aspect of human activity (Joyce & Loe, 2010b). Given the changes in the physical and cognitive capacity of older adults, living with some form of cognitive impairment means that this dynamic technological context presents new challenges and risks to them. For example, people living with cognitive impairment regard fewer technological devices as relevant for

their lives and generally perceive more difficulty when engaging with technology than older adults without cognitive conditions (Rosenberg, Kottorp, Winblad, & Nygård, 2009). The difference in perceived difficulty and relevance of technology, calls for a better understanding of how older adults with some form of cognitive impairment engage with technology in everyday life.

The lived experience of forgetfulness can lead older adults to implement strategies to manage the mismatch between cognitive capacity and external demands (Imhof, Wallhagen, Mahrer-Imhof, & Monsch, 2006). At the onset of MCI and SCD and experienced problems with technology, these strategies can take the form of engagement in cognitive stimulation activities (Hertzog, McGuire, Horhota, & Jopp, 2010; Montejo, 2003) and technology learning environments (Rosenberg & Nygård, 2016). In the Spanish context, this type of services are offered mainly through two types of community centres: recreational community centres for healthy older adults and Day Care centres for older adults with some form of diagnosed cognitive impairment (Prado, 2013). These places offer cognitive stimulation under the form of memory training. The recreational community centres offer technology training courses to its members, giving them the opportunity to learn how to use a computer or a mobile phone independently. Participants of this research were recruited in a recreational community centre and a Day Care centre for older adults in the Barcelona Metropolitan Area (BMA) to facilitate a purposive recruitment process of older adults with SCD/MCI.

This research will analyse the role of Everyday Technology (ET) in the capabilities of community-dwelling older adults living with SCD or MCI participating in a cognitive stimulation activities. The concept of ET was defined by Louise Nygård as incorporating “all the electronic, technical and mechanical equipment” that is present in everyday life (Nygård, 2008, p. 2). This is a broadly defined category that encompasses traditional technological objects such as white goods, landline telephones, TVs and bank cards, as well as newly developed Information and Communication Technology (ICT) devices such as smartphones, computers and tablets. Despite living with cognitive impairment, ET can play an important role in the maintenance of relatively high levels of independence and wellbeing of older adults (Hofmann, 2013; Novitzky et al., 2015).

The Capability Approach (CA) will be used as the theoretical lens to analyse the role of ET in the everyday activities of older adults living with SCD/MCI in Barcelona. The CA allows researchers to identify what how individuals, as agents, choose to be and do according to their specific values of what constitutes a good life. This approach also reflects on how particular social arrangements can expand or constrain the freedom to achieve these valued beings and doings (functionings) (Robeyns, 2005). ET has the potential of expanding or restraining the freedom of older adults living with SCD/MCI to fulfil their values and satisfy their needs. How this technology is perceived plays an important role in how older adults use it in the context of changing cognitive capacity in later life (Hedman, Lindqvist, & Nygård, 2016).

## **2. Research aim and research questions**

The following research question will guide this study:

**What is the role of ET in the capability set of community-dwelling older adults living with SCD/MCI participating in cognitive stimulation environments in Barcelona?**

### **2.1. Research sub-questions**

In order to answer this research question, the following sub-questions will be addressed:

- How is ET valued as a resource to enable the capability set of community-dwelling older adults living with SCD/MCI participating in cognitive stimulation environments in Barcelona?
- What achieved functionings related to the use of ET do community-dwelling older adults living with SCD/MCI participating in cognitive stimulation environments in Barcelona strive to achieve?
- What are the conversion factors for community-dwelling older adults living with SCD/MCI participating in cognitive stimulation environments in Barcelona that influence their capabilities?

### **3. Theoretical framework**

The Capability Approach (CA) will be used in this research as a framework to understand the role of ET in the capabilities of older adults living with some form of cognitive impairment. The CA, developed by Amartya Sen in the decade of 1990 (Sen, 2000) and further developed by Martha Nussbaum and other scholars, is a normative theory of human wellbeing and development in terms of the genuine opportunities that people have to achieve what they value in life in specific social arrangements (Robeyns, 2005, 2016b). This differentiates the CA from other approaches of wellbeing that consider material resources or mental states as the main indicators of wellbeing (Robeyns, 2016b). The CA is versatile and underspecified, allowing for multiple ways of adapting the framework to study and conceptualize phenomena that can enable or constrain human freedom to attain wellbeing (Robeyns, 2006). This research applies the CA considering the role of ET as a resources and a contextual factor for the enablement or constrain of the capabilities of community-dwelling older adults in the context of cognitive decline. The first section of this chapter will address the main theoretical components of the CA. The second section will present a literature review about the role of technology in older adults' daily life. The third section will present a technology-augmented version of the CA and the fourth section presents the conceptual model used in this research.

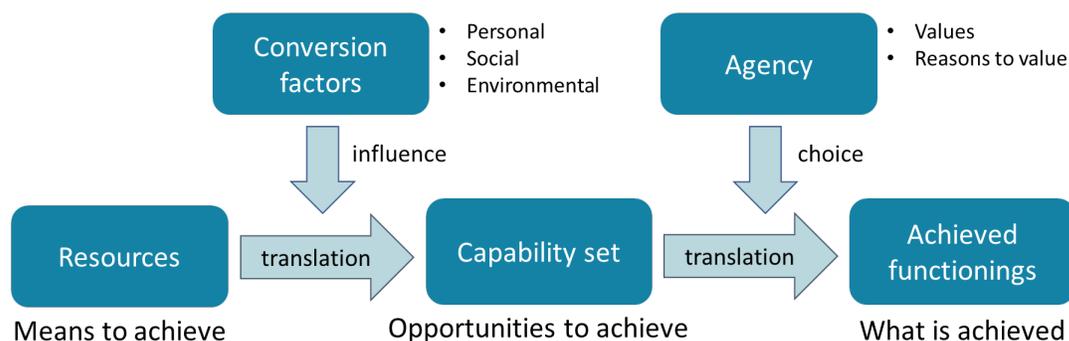
#### **3.1. The capability approach**

The central claim of the CA is that the capability to live a valued and dignified life depends on what people are able to do or to be in a specific context; rather than on the amount of resources a person or a community holds (Robeyns, 2005). In the context of this research, capabilities will be understood as the opportunities for individuals to realize important values to themselves (Robeyns, 2016a). The CA pays attention to how individuals or communities define important values in a given social and cultural context, providing the concept of capability, to summarize the “effective opportunities that people have to lead the lives they have reason to value” (Robeyns, 2006, p. 351). The set of capabilities comprise all the functionings from which people can choose to strive to achieve. Functionings are the beings and doings that the individual is capable of attaining. According to the principles of this

approach, people exercise their agency through the achievement of some of the available functionings. This is considered as an expression of values and of the reasons people have to value certain functionings before others (Alkire & Deneulin, 2009b). In this sense, the achieved functionings (beings and doings) foreground the choices people make in their daily lives and can shed light on the contextual factors that influence these choices.

To be able to translate capabilities into valued achieved functionings, individuals need to make effective use of the resources available to them. The CA assumes that individuals can access a certain set of resources depending on their personal, social and environmental circumstances. These circumstances are conceptualized as conversion factors (personal, social and environmental) that enable or restrain individuals from making effective use of the resources available to them and to translate them to actual functionings (Robeyns, 2005, 2016b). Thus, the set of capabilities of an individual is defined by their ability to transform actual resources into valued beings and doings available as capabilities. The degree to which individuals can successfully transform a set of resources and capabilities into beings and doings depends on their individual conversion factors. Conversion factors mediate this transformation of resources into functionings and they vary depending on the structural position of individuals in society through gender, age or health status (Ibrahim & Tiwari, 2014, p. 176; Lloyd-Sherlock, 2002). For example, older people with cognitive impairments face different conversion factors than older people without any impairments. Conversion factors that older adults with cognitive impairment could face may include social norms regarding age and technology use (Taipale, Petrovčič, & Dolničar, 2018) or the cultural stigma of forgetfulness (Cooper et al., 2011; Damant, Knapp, Freddolino, & Lombard, 2016). Conversion factors are central to the CA, as they account for the contextual diversity of individuals and how inequalities in terms of capabilities are socially produced (Chiappero-Martinetti & Venkatapuram, 2014, p. 4). The relationships between the main components of the CA as they have been explained are presented in Figure 1.

Figure 1: Relationships between the CA components.



Source: adapted from Robeyns (2005, p. 98)

The capability approach has been traditionally applied in normative and evaluative research of how social arrangements enable or constrain these capabilities at the macro and micro level (Ibrahim, 2014). In this type of research, development would be measured as the degree of freedom that a society offers to individuals or communities to achieve the life that they value. In this normative sense, the objective of any development policy should be the expansion of these individual freedoms or capabilities (Alkire & Deneulin, 2009a). Usually, this is achieved through the definition of quantitative indicators that aim to account for the dimensions relevant to describe capabilities and functionings (Robeyns, 2006). Nevertheless, the operationalisation of the CA is subject to a wide debate and it has been argued that an exclusive focus on quantitative indicators excludes important qualitative information about what is “important, good or morally obligatory” (Comin, 2008, p. 157).

The CA as a theoretical framework is versatile and underspecified, allowing for various applications in research (Robeyns, 2005), commonly for the identification of guidelines for the enablement of individual agency, or freedom, as the main indicator of development (Straehle, 2016). Nevertheless, the CA can also be used in “non-normative” or “non-evaluative” studies, in which the focus is placed on people’s perspectives on their own capabilities (Robeyns, 2006, p. 369). This research follows studies that use qualitative data to explore beliefs and evaluations associated to resources necessary to achieve valued functionings from an emic perspective (Al-Janabi, Keeley, Mitchell, & Coast, 2013; Biggeri, Libanora, Mariani, & Menchini, 2006; Ibrahim, 2014; Kimberley, Gruhn, & Huggins, 2012;

Van Ootegem & Spillemaeckers, 2010). This use of the CA has been labelled as a “grassroot exploration of human capabilities” by Ibrahim and Tiwari (2014, p. 27). The studies pertaining this branch of the CA research are usually qualitative and small-scale in nature. They aim to understand why people value certain resources and how they access them, how functionings are achieved and which capabilities are considered most important (Ibrahim, 2014). This approach is also interested in how people define what is valuable or not to live a valued life (Al-Janabi et al., 2013). The grassroots exploration of human capabilities puts emphasis on qualitative data and research questions oriented towards a definition of values and an emic conceptualization of capabilities. The research questions that guide this research can be included in this application of the CA; as it will discuss with participants what is or is not valuable in ET to achieve valued functionings related to the use of technology.

### **3.2. Technology and the capabilities of older adults**

The ubiquity of technology in modern everyday life of older adults has been linked with broad social changes in industrial societies starting from the second half of the 20<sup>th</sup> century (Gilleard, 2017). After the Second World War, the transformation of traditional social institutions such as the nation-state, the factory and the nuclear family brought together the emergence of new ways of constructing individual identities and lifestyles through consumption (Beck & Lau, 2005). This broad societal change also saw the expansion of technology from its traditional place in mass production in the factories to people’s homes through consumption and the market economy (Gilleard, 2017). Starting from the 1950’s, household appliances and the first ICT devices, such as TVs and radios became ubiquitous in most of the homes of high-income societies. As a result of this process, everyday technology has acquired the capability to enable all reproductive and domestic activities up to this date.

Later life was not alien to this process, as the structure of the life course also saw changes due to the emergence of a “Third Age” characterized by leisure and self-realization after retirement rather than unproductivity and impairment (Gilleard & Higgs, 2013; Laslett, 1996). Gilleard argues that the expansion of technology to other spheres of life and the market consumption impinged a strong influence on social identities of older adults in the new context of the third age (Gilleard, 2017, p. 13). The place of older men and women in society

did not depend anymore on their working life or on rigid gender and familial relationships, but rather on a set of consumption practices of commodified lifestyles that produced heterogeneous ways of aging (Phillipson, 2007). This idea underlies the historical roots of the penetration of every technology as a commodity in older people's life and capabilities. Technology became a resource for "successful ageing" in which individuals were able to be healthy and to keep an active role in society (Bülow & Söderqvist, 2014; Liang & Luo, 2012). Gilleard and Higgs propose that these ideas of third age and successful ageing were constructed in opposition to a "fourth age" or advanced age, in which the negative aspects of the ageing process were deposited, namely the loss of cognitive and physical capacity and thus, agency (Gilleard & Higgs, 2010).

The relationship between technology and older adults in the context of a changing cognitive capacity associated with advanced age has been mostly studied from the perspective of assistive technology (Hofmann, 2013; Kenigsberg et al., 2017). This is a particular way of conceptualizing technology as a resource that can assist individuals "to perform activities that otherwise they would be unable to do" (Kenigsberg et al., 2017, p. 3). Under such perspective, technology is considered as a way of supporting the agency of older adults living with cognitive impairment to live an independent life. However there exist the risk that assistive technology could take away the capacity to make decisions from older adults, especially in the case of surveillance and tracking technologies (Astell, 2006). The ethical implications of this type of technology generates a broad scientific debate about the objectives of technology and the importance of person-centred care perspective in assistive technology design (Kenner, 2013; Novitzky et al., 2015; Peine & Neven, 2014; Schulz et al., 2015).

Another perspective on the relationship between technology and older adult's capabilities emerges from the idea that the distinction between assistive and everyday technologies is blurred due to technological advancements (Emiliani, 2006; Hofmann, 2013). ICT devices such as smartphones and a wide range of white goods are starting to include functionalities aimed to fulfil the needs of people living with cognitive impairment (Hedman et al., 2016). In this sense, the way in which older adults living with cognitive impairment relate to everyday technology becomes relevant to understand wellbeing in later life. The consideration of older adults as human cyborgs (Brittain et al., 2010; Zheng & Stahl, 2012)

or “technogenarians” (Joyce & Loe, 2010b) opens up a field of study that considers them as active and creative users of technology rather than passive recipients of technological interventions.

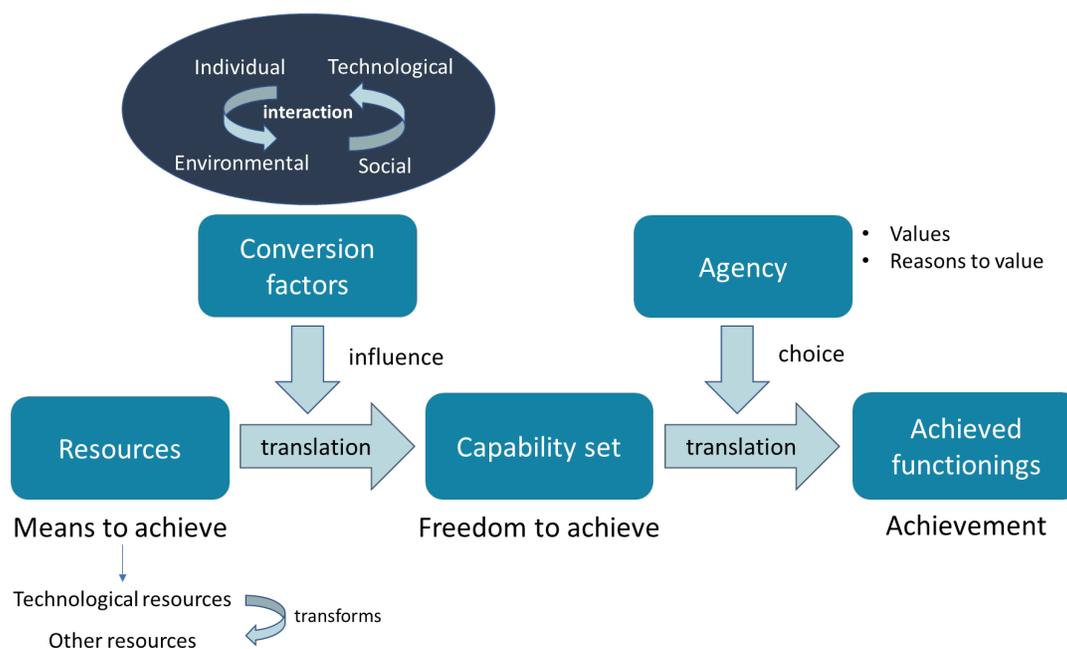
Studies in high-income societies have found that older adults living with cognitive impairment continue to strive to learn how to use technology and to adapt their characteristics to their new needs (Barnard, Bradley, Hodgson, & Lloyd, 2013; Rosenberg & Nygård, 2016). Studies about acceptability of technological interventions in this population have shown that assistive devices tend to be rejected as they foreground the abnormality of older adults’ cognitive capacity in daily life (Barnard et al., 2013; Peek et al., 2014). Other studies have concluded that technology can have a practical and existential meaning to older adults living with cognitive impairment, beyond its assistive purposes, to achieve valuable goals in daily life (Hedman et al., 2016; Nygård, 2008). In this new context of a blurred division between ET and assistive technologies, it becomes relevant to study how technology plays a role in the capabilities of older adults living with cognitive conditions.

### **3.3. Technology-augmented model of CA**

This research will focus on the role of technology in participant’s ET related capabilities using an augmented version of the CA conceptualization that includes technology as a special type of resource and conversion factor. Building on the idea of conversion factors present in Ingrid Robeyns’ work (2005, p. 99, 2006, 2016b), Haenssger and Ariana (2018) propose that the technological context of an individual is a distinct type of conversion factor. Since technology exists in a dialectical relationship with the personal, social and environmental conversion factors, and contains the whole extent of technological knowledge and capacity of a society. This idea follows the definition proposed by Oosterlaken (2011), in which technology is an ontological part of human capabilities in modern society. Hence, the technological context acquires the category of a social structure capable of interacting with human agency and the other structures in which it is embedded. One example can be the development of ICT and its effect on social norms and infrastructures of communication. Andersson et al. give the example of how an improved accessibility of ICTs in poor countries can affect other valuable resources such as information, rendering it more accessible than before and stimulating structural changes in society (Andersson, Grönlund, & Wicander,

2012). The ET resources available in any given context are then considered as a special type of input, or resource, for capabilities. These resources present a dual nature in which they generate opportunities for the achievement of valued functionings, i.e. their intrinsic characteristics have a generative capacity, and they also transform the characteristics of other resources, i.e. they have a transformative capacity (Carpenter, 2009; Haenssger & Ariana, 2018, p. 7). The authors illustrate the duality between the generative and transformative capacity of technological resources using food ingredients and cooking as an example. Ingredients of a certain meal and the cooking stove have a generative capacity: ingredients generate the capability of being properly nourished and the cooking stove generates the capability of preparing meals. However, the cooking stove as a technological object has the capacity of transforming the ingredients into a meal with certain characteristics of flavour and nutritional value. This affects both the characteristics of the ingredients as a resource and the capability to prepare a meal in a specific way using the cooking stove. Haenssger and Ariana (2008) applied this conceptualization of technology in the CA with the use of mobile phones as a resource for the valued capability to receive healthcare. Mobile phones are inserted in a technological context that power certain types of functionings, e.g. a mobile connection network to be able to call a doctor. Consequently, they transform other resources such as healthcare by transforming the way people interact with healthcare providers. The relationship between the components of the technology-augmented CA are presented in Figure 2:

Figure 2: Relationships between the technology-augmented CA model components.



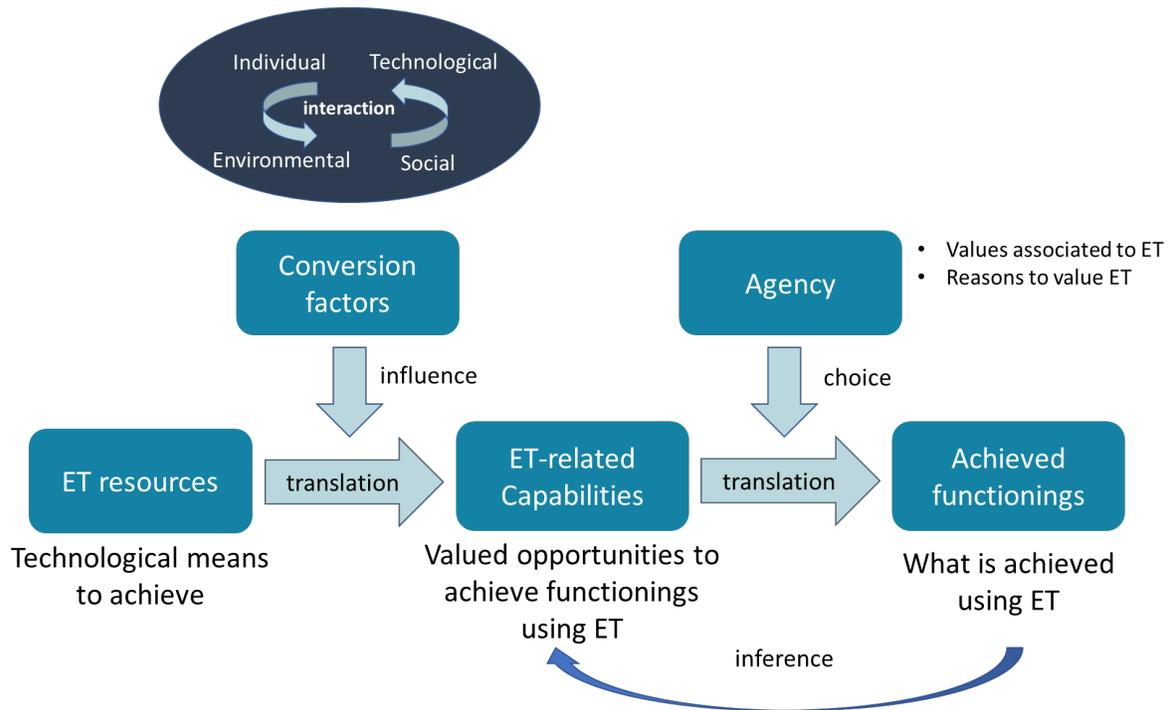
Source: Adapted from Haenssger and Ariana (2008, p. 104) and Robeyns (2005, p. 98).

This research will ask participants to engage in a reflection about the role of ET resources in their capabilities to achieve valued functionings related to the use of technology. In this sense, ET will be considered as a type of resource currently widely available in the modern world (Kenigsberg et al., 2017; Zheng & Stahl, 2011), whose utilisation and valuation is mediated by a series of conversion factors (personal, social, environmental and technological). Through the analysis of how ET is valued as a resource and to achieve valued functionings, how older adults choose to use ET to achieve valued functionings and how conversion factors influence these specific uses of technology, this research will infer a set of technology-related capabilities for older adults in the context of cognitive impairment. In this way, a list of achieved functionings will serve as indicator of valued capabilities in later life in the context of cognitive impairment. This strategy puts focus on the achieved functionings of older adults in the context of a non-normative study of valued capabilities.

### 3.4. Conceptual model

The following conceptual model (Figure 3) summarises the characteristics of the technology-augmented version of the CA conceptual model used in this research.

Figure 3: Conceptual model of the technology-augmented model of the CA used in this research



Source: adapted from Haenssger & Ariana (2018, p. 104) and Robeyns (2005, p. 98)

#### **4. Research methods**

This research will adopt a qualitative methodology to understand how participants experience and value the use of ET in their daily lives. The study of the role of ET in older adults' functionings and evaluations through qualitative research allows for a better understanding of the participant's experience of technology use and the technological context that surround them (Watson, Murphy, Dingwall, Greatbatch, & Parker, 1998). This type of research follows an interpretative paradigm, in which subjectivity is addressed in the participant's own terms, i.e. from an *emic* perspective (Hennink, Hutter, & Bailey, 2010). In this particular study, the CA as a normative theoretical framework allows to focus on how ET is valued as a resource and how the social context shapes freedom the way older adults use it to achieve valued functionings (Haenssger & Ariana, 2018; Robeyns, 2016b).

To answer the research questions that guide this study, in-depth interviews were used to explore the participants' experiences and beliefs about ET. To study the role of ET in the capabilities of older adults, this study focused on the resources available to participants, the conversion factors that influence access to these resources and the functionings that participants are able to achieve using ET (Al-Janabi et al., 2013). Data produced through the interviews was later analysed following a strategy according to the principles of informed grounded theory (Dickson-Swift, James, Kippen, & Liamputtong, 2007; Thornberg, 2012).

Section 4.1 explains the recruitment of participants and the fieldwork process. Section 4.2 addresses the use of in-depth interviews as the instrument of data collection. Section 4.3 explains the method for analysing the data. Section 4.4 discusses the ethical implications that were relevant in this study. Section 4.5 will explain the study context and section 4.6 presents a reflection on the positionality of both researcher and participants.

##### **4.1. Fieldwork and participant recruitment process**

The fieldwork was carried from September to October 2018 in the Barcelona Metropolitan Area (BMA). The fieldwork started with contacting relevant institutions where participants with cognitive impairment could be found. This was a process of purposive recruitment, in which the researcher engaged in the search of 'information-rich' informants that presented specific characteristics relevant to the topic of study (Hennink et al., 2010, p. 107–8). In the

first stage of this process, the researcher identified the existence of “Casals” and Day Care Centres in the BMA context, both types of institutions usually carrying cognitive stimulation activities for older adults (Vidal-Martí & Borrell, 2013). The researcher contacted 56 community and Day Care centres in the BMA, distributing an information sheet about the study through e-mail (see Appendix II, in Spanish). All of the community centres were also contacted by phone in the hope of reaching the director or coordinator of the memory workshops of each centre. Ten of these places were also visited in person with the aim of explaining the research objectives face to face to the directors. In the end, only two directors agreed to collaborate in the recruitment process. One of them was from a recreational community centre for older adults with and without health issues at the Gracia district. The other one was the director of a Day Care centre for older adults with some degree of physical and cognitive disability at the Hospitalet district. These two places offered members cognitive stimulation activities under the form of memory workshops. Additionally, the recreational community centre offered the possibility to participate in computer and mobile phone training workshops. The directors of these two centres agreed to collaborate with this study under the following conditions:

- a) Participants could be interviewed only once and for a maximum time of one hour and a half.
- b) All interviews had to be carried out at the centres’ facilities.
- c) The research results would be shared with the centre’s directors through a summary written in Spanish.
- d) In the case of the recreational community centre, the researcher would offer an open talk about the research topic on October the 24<sup>th</sup> 2018.

The procedure for recruitment was agreed with the directors of each centre. In the case of the recreational centre, the director allowed the researcher to visit three instances of the memory workshop to directly invite members to participate in the study. In each instance, the researcher did a pitch presentation explaining the research topic to the attendees of the workshop. The interested attendees approached the researcher after the workshop was over to schedule an interview. Twelve participants (three men and nine women) were recruited in this way. In the case of the Day Care centre, the director of the centre agreed to search for

suitable participants with MCI among the users of cognitive stimulation activities. As a result, three women with diagnosed MCI were recruited in this way. One male participant with moderate cognitive impairment was recruited directly since he was a neighbour of the researcher during his stay in Barcelona. The participant fulfilled all the requirements to participate and his wife, as main caregiver, gave assent to his participation. The inclusion criteria for all participants were:

- a) To be 65 years old or older.
- b) To reside in the Barcelona Metropolitan Area.
- c) To participate in a cognitive stimulation activity (memory workshop).
- d) To be able to give written consent to participation independently.

The participation in a cognitive stimulation activity was considered as a possible proxy for living with a cognitive condition, whether it was SCD or MCI. During the interview, participants were asked to self-report if they had received any diagnose of cognitive impairment or if they presented symptoms of SCD. Nine participants reported having worries about memory problems that could be interpreted as SCD during the interviews, namely having problems to remember things during conversations, forgetting the purpose of an activity when entering a new room or perceiving changes in social relationship due to forgetfulness (Cooper et al., 2011; Jessen et al., 2014).

All of the sixteen participants were part of a cognitive stimulation environment either at the Recreational Community Centre or the Day Care Centre. Five of the twelve participants also reported attending workshops on information and communication technology (ICT) training. Fifteen out of the sixteen participants lived in an apartment equipped with elevators. One participant lived in a house with his spouse. The totality of participants were already retired and did not engage in any economic activity. The educational level of participants was diverse and ranged from no schooling (three cases) to Ph.D. studies (one case), with a majority of people having basic schooling (seven cases). In Table 1 a summary of participant's characteristics is presented:

Table 1: Participant's main characteristics (in the order they were interviewed)

Nr.	Pseudonym	Gender	Age	Marital status	Cohabitation status	Educational level attained	Self-reported condition	Place of recruitment	ICT training?
1	Enric	Male	84	married	with spouse	Primary	Moderate CI of vascular reasons	Neighbourhood	No
2	Jordi	Male	80	married	with spouse	Ph.D.	MCI	RCC	Yes
3	Beatriz	Female	89	widowed	with daughter	Primary	No SCD/MCI	RCC	Yes
4	Antonia	Female	76	widowed	alone	Primary	SCD	RCC	No
5	Assumpció	Female	80	widowed	with daughter	Primary	SCD	RCC	No
6	Sergi	Male	75	married	with spouse	University	SCD	RCC	No
7	Arnau	Male	82	single	alone	Technical	SCD	RCC	Yes
8	Gemma	Female	76	single	alone	University	SCD	RCC	No
9	Ignacia	Female	77	married	with spouse	Primary	No SCD/MCI	RCC	Yes
10	Eugènia	Female	76	widowed	alone	Primary	SCD	RCC	No
11	Carme	Female	70	married	with spouse	Technical	SCD	RCC	No
12	Neus	Female	82	widowed	alone	University	SCD	RCC	No
13	Josefina	Female	74	married	with spouse and son	No schooling	MCI	DCC	No
14	Carlota	Female	83	widowed	alone	No schooling	MCI	DCC	No
15	Dolores	Female	78	married	with spouse	No schooling	MCI	DCC	No
16	María José	Female	70	married	with spouse and son	Primary	SCD	RCC	Yes

DCC: Day Care Centre

ICT: Information and communication technologies

MCI: Mild cognitive impairment

RCC: Recreational Community Centre

SCD: Subjective cognitive decline

## **4.2. In-depth interviews as data collection instrument**

This research used in-depth interviews to explore participant's views and experiences acquiring, adopting and using ET devices in their daily lives. In-depth interviews allow researchers to access the narratives, experiences and points of view of individuals and to identify values and norms among a group of people sharing similar characteristics or living in similar contexts (Hennink, Hutter, & Bailey, 2010). In an in-depth interview, the interaction between participant and researcher takes the form of a conversation using a semi-structured interview guide to address relevant topics to the study (Appendix I). This guide is designed to also allow new topics to emerge in the conversation that were not considered in the design of the interview guide (Gaínza, 2006; Hennink et al., 2010). The open nature of the interview guide allows for the integration of previously unidentified topics to the conversation and the identification of saturation of information when no new topics emerge (Hennink et al., 2010). In every occasion, the researcher recorded the conversations using a digital voice recording device in order to verbatim transcribe them and facilitate the process of analysis. The conversations with participants lasted from 40 to 85 minutes in total, with an approximate average of one hour of conversation.

In-depth interviews allow to explore perceptions, meanings and experiences of participants using ET as resources for the achievement of valued functionings (Haenssger & Ariana, 2018). In this research, participants were asked to describe their views on the activities they developed at the community centres where they were recruited and their thoughts of life at home. After that, they were asked to identify the ten most important devices in their daily lives. Then, the conversation focused on how they got these devices, how was to learn to use them and for what purpose they used these devices. It was not possible to discuss every device that was mentioned in the interviews due to time restrictions. After the interview, the researcher took field notes to describe the context in which the conversation took place, the mood of the conversation and general attitude of the participants and, the reflections of the researcher regarding what was discussed. The interview guide was reviewed after each interview. The notes allowed the researcher to identify possible new relevant questions regarding experiences of acquisition and adoption of technology, as well as the important actors and places that played a role in this process.

Before carrying out the fieldwork, the researcher pilot-tested the first version of this interview guide with two healthy senior participants (with one Dutch man in English and one Chilean woman in Spanish) that were not included in the analysis. This process allowed the researcher to test whether the formulation of interview questions elicited relevant reflections on ET use in daily life (Hedman et al., 2016). As a result, some modifications to the original interview guide were introduced. For example, space for a list containing the ten most important ET devices present in participants' daily life was included as well as a final question about recommendations to other older adults with memory problems that wanted to use ET.

### **4.3. Data analysis**

The data produced through the in-depth interviews was digitally recorded and transcribed verbatim. Then, the data was subject to a coding process using the Atlas.ti 8.0 software package. The coding and analysis process followed the principles of informed grounded theory (Thornberg, 2012). This type of analysis strategy allows the researcher to have a specific theoretical framework in mind while using elements of the grounded theory coding process. In this case, the theoretical framework of the CA was used as an “heuristic tool” for analysis (Thornberg, 2012, p. 7). This heuristic approach places theoretical frameworks as “lenses” while doing informed grounded theory analysis. Having in mind a specific theoretical framework, the researcher guides the data analysis engaging in a constant process of comparison between the underlying structure of the data and the theoretical relationships between concepts.

The coding strategy followed an initial open coding process after the data had been transcribed. This inductive process allowed the researcher to identify what activities were valued by participants, their ideas regarding technological resources and the contextual characteristics that influenced their use of technology. These initial codes were later re-examined by the researcher for the construction of deductive categories describing values associated to ET, the valued functionings related with technology in everyday life and the influence of conversion factors in how participant's valued and used ET. This process involved the exploration of links between the central components of the CA, i.e. resources, valued functionings and conversion factors. For the elaboration of these categories, code-document tables were created in Atlas.ti 8.0 and compared. This process allowed for the

comparison of how similar activities, values and contextual factors related to the use of ET manifested in the data.

#### **4.4. Ethical issues**

Since this research aims to integrate people with a diagnose of MCI as participants, some ethical issues were considered with giving consent to participate and the use of data. All participants were able to independently give consent to participate by reading and signing the informed consent form (see Appendix III). Additionally, in the three cases that were recruited at the Day Care Centre, the director approached a family member on behalf of the researcher and asked for verbal assent to participate.

The informed consent form document explained the main objectives of the research project and its methodology in a language accessible to the general public. The contents of the document were also discussed in person with all the participants before they signed it. The researcher was available to clarify any doubts regarding the study before and after the informed consent has been signed. Participants were explained that, if during the interviews, they felt emotional, lost or distressed, the researcher would try change the difficult topic or stop the conversation. This did not happen in any of the conversations with participants.

The researcher was aware of the specificities of engaging in long and complex conversations with people living with some form of cognitive impairment. Older adults living with this condition could spontaneously lose track of their ideas or forget important concepts when giving explanations (Vigorelli, 2005). With the intention of not generating distress in the participants, the researcher was cautious of respecting the pace of the conversations and not to insist on forgotten ideas. For example, some participants expressed that they had difficulty to answer some questions due to forgetfulness:

“Well I do not remember, that's what I have that I do not remember my birthday, I lose a lot of my memory and I do not remember. (Enric, 84, lives with spouse, Moderate Cognitive Impairment due to vascular reasons).

Interviewer: Is there any activities in the workshop that you find particularly easy or difficult?

Eugenia: At the memory workshops? Well, there are some activities that are difficult, but I can't remember them now... as you can see my memory is not that good. (Eugenia, 76, lives alone, SCD).

The researcher procured not to emit any judgement about forgetfulness, giving the space to participants to calmly develop ideas or to change topic if they decided they could remember what they were going to say.

Only the researcher and his supervisor had access to the data for analysis. The researcher transcribed the conversations produced through the in-depth interviews and names of people and places were anonymized to protect the privacy of participants. All the data produced and processed in this research was safely stored in the researcher's student account provided by the University of Groningen. After completion of this study and further de-registration of the researcher from the University, the data will be stored in an external hard-drive property of the researcher and protected with a password only known to him.

This study followed the ethical clearance evaluation procedure provided by the Research Ethics Committee of the Faculty of Spatial Sciences of the University of Groningen. This procedure consists in a self-evaluation of the possible risks that a research project might entail to participants. The researcher has to evaluate the risks associated with the characteristics of the participants and the methodology of the study. If the researcher deems that participation in the study entails greater risks than the minimal risk of participating in social science research<sup>1</sup>, the project has to be evaluated by the Research Ethics Committee. After following the evaluation procedure, the researcher judged that participation in this research did not entail a greater-than-minimal risk for participants' wellbeing. This meant that evaluation from the Research Ethics Committee was not deemed necessary.

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<sup>1</sup> Footnote defining minimal risk from the Research Ethics Committee evaluation form: "Risk is often defined by reference to the potential physical or psychological harm, discomfort or stress to human participants that a research project might generate".

#### **4.5. Research context**

This research was carried out in the context of two community centres for older adults in the BMA, one in the Gracia district of the Municipality of Barcelona and the other in the Municipality of Hospitalet, both part of the BMA. These two territories share a similar population structure, with approximately 20% of both populations aged 65 or older (Ajuntament de Barcelona, 2018; Ajuntament de L'Hospitalet, 2019). However, the Gracia district has a highly educated population with medium- to high-income levels, whilst the population of Hospitalet is less affluent and with lower educational levels (Ajuntament de Barcelona, 2018). This difference can be attributed to Hospitalet's character as a place where economic migrants settled from other parts of Spain during the 20<sup>th</sup> Century to engage in low-wage labour.

The Centres where the participants were recruited are part of the care system for older people in Spain. The recreational community centres for older people receive the name of "Casal" (big house) in Catalan and have a long tradition of being a space of socialization for local older adults. These centres are present in all districts of Catalonia and offer spaces for the development of workshops and meetings for its members. To be a member, older adults must reside in the local district and be 60 years old or older (Generalitat de Catalunya, 2019). The Day Care Centres for older adults first appeared in the 1990s as a private initiative of Family Associations of dementia patients in order to provide support for family caregivers of older adults living with dementia (Prado, 2013). The Dependency Act of 2006, the law that regulates the social services for long-term care in Spain, included Day Care Centers in the list of subsidized services for persons living with disabilities and support for family caregivers (Peña-Longobardo, Oliva-Moreno, García-Armesto, & Hernández-Quevedo, 2016; Prado, 2013). These centres offer therapeutic and rehabilitation services for its older users and psychological support for family caregivers. Older users can stay in these centres for a maximum of eight hours during the day or night, depending on their needs, and can access the centre's services through a co-pay (Prado, 2013).

#### **4.6. Positionality**

In this section, the positionality of the researcher will be addressed reflecting on the interactions with the participants. In qualitative research, the researcher is involved in a series of encounters with participants that could have a different social position or personal background. It is useful to reflect on these differences to render the research process more transparent and accountable (Hennink et al., 2010).

The three biggest differences in background between the researcher and the participants were nationality, mother language and age. The researcher is of Chilean nationality and a native speaker of Spanish, while all the participants were of Spanish nationality, with some of them migrating from other parts of the country to Barcelona at an early stage of their lives. Currently, the political events in Catalonia make the topic of nationality a very politically-charged discussion, and this contingency topic was avoided during the interviews with participants. Most of the participants reported being completely bilingual in Catalanian and Spanish and it was not difficult to carry out the interviews in Spanish. Some specific words of the Spanish spoken by older adults in the BMA emerged in the first interviews. These terms were identified by the researcher and consulted with native speakers about their meaning.

When they first approached the researcher, some participants expressed their intention of helping the researcher to fulfil his Master Thesis. They explained that they had younger relatives that also had to do similar works for their education and felt motivated to help someone in the same situation. Participants also expressed their content with participating in a research about the relationship between older adults and technology, as they considered this was a very important issue. The interviews were carried at the reading room of the Recreational Community Centre and at the Director's office in the case of the Day Care Centre. Both these spaces provided a quiet and comfortable setting to interview the participants.

One of the most complex topics to address during the interviews was the participants' cognitive condition. The researcher tried to address this at the beginning of every interview to frame the conversation in the context of cognitive impairment and evaluate the participant's reaction to the topic. When asked about their cognitive diagnoses, three

participants with MCI them did not address the topic directly. Only one case explained how his MCI diagnose and changed with time due to a treatable condition that affected his level of cognitive decline. This participant was highly educated and had scientific knowledge about dementia conditions. In effect, the rest of the participants were unable -or not willing- to describe the specificity of their own conditions, some of them describing them as “memory problems” or as a “mild form of Alzheimer’s disease”. The next example of a female participant living with diagnosed MCI by the Day Care Centre professionals illustrates this disparity between condition description and attributed diagnose:

“Interviewer: What do you think about the memory workshop?

Josefina: They are very good, I would be worse off [without them]... I forget many things. I know I had some Alzheimer’s, but I can see that it has stagnated.” (Josefina, 74, cohabits with spouse and son, MCI)

One possible explanation to this way of addressing the topic of cognitive decline could be a lack of information about mental health conditions in Spanish society (Arriola & Cristóbal Carnero, Alberto Freire, Rosa López, José Antonio López, Sagrario Manzano, 2017) and the diffuse criteria that define cognitive impairment and decline, that could be difficult to grasp for patients living with these conditions (Cooper et al., 2011; Lingler et al., 2006). Nevertheless, this topic did not elicit emotionally-charged reactions from participants, and participants were capable of describing their “memory problems” in different daily situations in a calm way, even if they framed this as an important loss or disruptive factor. In the cases where participants lived with diagnosed MCI (three cases recruited at the Day Care Centre), it was more difficult for the researcher to focus the conversation on the research topic, as participants addressed their daily routines in a broader way. Multiple encounters with these participants would have allowed the researcher to explore deeper relevant topics identified in the first interview.

## **5. Findings**

### **5.1. Introduction**

This research focused on how technological resources present in everyday life play a role in the capabilities of older adults in the context of cognitive decline/impairment. The in-depth interviews show how participants ascribed specific values to technology and chose ways in which to acquire and adopt technological devices in their daily activities. These everyday technological objects influence how older adults interact with social and family networks, develop activities in their environment and construct their identities. Throughout the findings, the description of the examples from the data will address the three main components of the CA that guide the sub-questions of this research: valued resources, achieved functionings and conversion factors.

The following sections will address the participant's functionings involving ET use, grouped in three valued capabilities: to use ET in daily life, to live at home using ET and to engage with ET in the context of memory issues. These three capabilities are the result of the analytical process and emerged as the valued opportunities the participants could access in their lives through the use of technology. Thus, the achieved functionings described in the findings are taken as expressions of the ET-related capabilities of older adults. These three capabilities are by no means the complete description of the capability set of the participants, nor they encompass the complete range of ET resources and functionings. These emergent capabilities aim to illustrate the role that ET can play in the capability sets of older adults in the context of old age and cognitive decline.

In general, participants were able to distinguish between "everyday technology" and "new or digital technologies", the latter corresponding usually to ICT. For most of them, their first approach to ICT occurred during their work life or through the influence of younger generations in their families. In the case of everyday technology, most of the participants remembered having contact with devices such as washing machines, refrigerators or TVs and radios for most of their lives. In this section, the term ET will be used to describe technology as a general category (also encompassing ICT). The term ICT is used to describe devices specifically made for communication and information.

In this chapter, data will be presented using quotations from the interviews that were translated from Spanish into English. When a quotation included information that is not relevant to the point being illustrated, those pieces of information will be replaced by a ‘(...)’. When deemed necessary, pieces of information will be added to the quotations in brackets ‘[...]’ to help the reader understand the meaning of the phrase. The purpose of these examples is to illustrate the point being described and to clarify the analysis made by the researcher. After each quotation, information about the participant will be presented in parenthesis: a pseudonym, age, cohabitation situation, and cognitive condition (SCD, MCI or no SCD/MCI<sup>2</sup>).

## **5.2. The capability to use ET in daily life**

This section addresses the capability to engage with ET in daily life. When asked about how they used technology, participants described the ways in which they acquired, adopted and incorporated technological objects in their activities. The role of the social context of the participants also became salient in how participants solved problems encountered with technology. In the following examples, the social context of the participants emerges as a source of social support for the use of ET devices, provided by the family or other actors in their networks regarded as experts.

### **5.2.1. To adapt preferences to own possibilities when using ET**

Being an older person was associated by participants with an increased difficulty to use new devices and with a lower capacity to remember complex instructions; especially in the case of ICT. As a result, some of the descriptions on how the participants actually used technology followed the idea that they adapted their preferences to what they could do. Dolores explained that she finds it very difficult to use her mobile phone to other purposes than calling:

“I’m in the doldrums with that [my mobile phone]... (...) I can remember how to answer, but I have never taken photos with it, because I’m not capable... my mind, it’s just that I have never wanted to make an effort, I have a very bad memory. (...) my mobile phone is very simple, my son bought it for me. I open it, I push the button and I speak... and that’s enough! I don’t trouble myself with that... I am a very calm

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<sup>2</sup> Only one case included in this sample lives with moderate cognitive impairment due to vascular reasons. This will be made explicit in the examples derived from that interview.

person and I don't mess with taking pictures [with the phone]." (Dolores, 78, lives with spouse, MCI).

In this example, Dolores actively decides not to engage in what she considers to be too difficult for her. Engaging with ET in this way, participants adapt their expectations about their own performance using devices in a versatile way. This idea was recurrent among participants, who reported having defined specific and more achievable purposes for their devices. This way of functioning with devices was the result of an evaluation of their own individual capacities faced against the possibilities that the devices offered. Participants often mentioned that they did not know how to grasp all possibilities a device offered, and preferred to restrain using functionalities that were deemed too complicated. In the previous case, the personal conversion factor of lacking the ability to use the mobile phone for other purposes bars Dolores from accessing particular resources such as apps.

The same reasoning emerged when participants were asked about their ideas on updating ET devices. María José explained that she would have the expectation to encounter a more complicated device in case she needed to replace her washing machine:

"If I had to... if something broke down, for example the washing machine. [My current one] I know how to use it with eyes closed. But probably... if I had to buy a new one today. Probably it would be a very digital thing... and it might be difficult for me and I would be blocked at the beginning. Until I learned again." (María José, 70, lives with spouse and son, SCD)

In this case, María José expressed her preference for simpler devices over newer ones with increased functionalities. In her opinion, the personal characteristic of having a positive attitude towards learning how to use a new device would make it easier to adopt a new ET resource. Participants also mentioned that they kept the instruction manuals of the devices they had bought, in case they encountered any difficulties with the device. The accessibility of those instruction manuals was deemed very important, some of them recalling having difficulties when reading them in the past. In this sense, the instructions manual becomes a valuable resource, capable of rendering new devices more accessible. This in turn allows for the expansion of the capability to use ET devices.

### 5.2.2. To ask for help from ‘technology experts’

All of the participants identified having a ‘technology expert’ to whom they could turn and ask for help in case they encountered problems with devices. Usually, these experts were younger members of their families or trusted ET providers, typically salespersons at retail stores or local shop owners. These people played a crucial role in the acquisition and adoption of ET devices into the participants’ daily lives. This was especially the case for more ‘complex’ ICT devices such as smartphones or tablets. These ‘experts’ also supplied older adults with support when facing difficulties to solve problems related to ET. Antonia, for instance, explained how she relies on the advice of younger family members to buy ICT devices:

“My Tablet, I bought it with my granddaughter... and because, of course, children know better about these things. And she told me “this one grandma, this one is good for you” and then my computer, I bought it much before, I bought it with my sister-in-law, she also knew a lot of computers, she also advised me on [which one to buy]” (Antonia, 76, lives alone, SCD).

Antonia continues her story explaining how she was able to solve a problem with her mobile phone by calling the company, but that she would have preferred to have someone to ask for help directly:

“I want to explain to you that at this point I feel stunned, you know? I feel stunned because that I see that on my own I can’t... If I had someone by my side that really understood the device], it would be great for me, to ask them something that is, that would get me out of trouble” (Antonia, 76, lives alone, SCD).

This example illustrates how older adults choose to rely on intergenerational solidarity as a source of support for acquiring and solving problems with ET. Participants share the idea that younger people “know better” how to engage with ET they are valued as a resource for the achievement of using ET in daily life. Similar roles were performed by ‘experts’ from outside the family. In the cases where the participants acquired ET devices without the help of family members, they mentioned that trust in technology providers was crucial for them to make the decision to a device. In the case of ICT devices, participants trusted this providers with the task of finding the device that best suited their needs:

“I bought my mobile phone from a [salesperson] (...) and he is a very nice person, very helpful and he inspires trust and that’s why I bought the mobile phone from him and I don’t regret it, but now I have to visit him and ask him some questions because with the previous model I had it was easier and with this (phone) now it’s more complicated for me” (Arnau, 82, lives alone, SCD).

These examples illustrate the importance of the social context of older adults living with cognitive impairment. This importance was also present in the cases where participants had to solve problems, such as updating to new ET devices when the old ones presented problems. When asked on their thoughts about changing old ET devices for a newer version, the responses varied depending on the reasons for the change. In the case that a device broke down, most of participants explained that they would prefer to replace the object with a new one, if the reparation costs proved to be high. The participants would rely on the help of a trusted person or reparation service to decide if it was worthwhile buying a new device. This points to the importance of social conversion factors in the form of social support and trust for the access to new devices. Participants established trust relationships with people present in their social context in order to access ET and these individuals can also then serve a role of helpers in the solution of problems.

### **5.2.3. To not engage with certain ET devices**

In some cases, participants explained how they decided not to engage with certain ET devices in their daily lives. For example, the use of bank cards was sometimes seen as problematic. Josefina explained how she prefers to use money instead of bank cards to do shopping, fearing that she would not be able to remember her PIN code when buying something:

“I pay everything with money, I don’t have a card and I don’t want to have a card... No, because I would forget the number and I just buy around here the neighbourhood and everyone knows me... sometimes with my wallet, with the coins I get into more trouble than with notes... notes are 5 euros or 10, or 20... but with this junk [coins] I get more confused” (Josefina, 74, cohabits with spouse and son, MCI)

She decides not to engage with this ET, acknowledging the risks that cognitive decline could entail when using banking cards that require to remember a number. She also feels she can

trust her local community to do shopping, increasing her sense of safety when carrying this daily task.

In other cases, the use of ET would go through a selection process in order to suit the participant's preferences and skills. For example, Jordi explained that in his mountaineering hobby, he relied on maps to navigate their way in the mountains and used a hiking watch equipped with meteorological sensors to interpret weather conditions. When some friends offered him a GPS as a gift, he did not accept it explaining that he did not need it because it was for "fools". In another case, Antonia explains that she prefers to manage her bills personally instead of relying in the computer:

"My daughters use the computer a lot for their bills, bur for me... it's not useful, I don't manage my bills there... I manage them myself, as always (...) I manage my bills mentally, that's what my head is for!". (Antonia, 76, lives alone, SCD).

Antonia regards the use of ICT as a deteriorating factor, in which the outsourcing of mental abilities could make her loose the capacity to manage her personal affairs more rapidly. Devices such as these can be used to manifest skills and manage the social presentation of the self. This way of engaging with ET responds to an individualization process of preferences rooted in the participant's life course and present health status.

#### **5.2.4. To manage social contacts through ICT**

Participants often reflected on the possibility to manage their social contacts through ICT devices. Almost all of the participants reported being able to regularly use a mobile phone or a computer to communicate with others. In these cases, the use of WhatsApp was salient. Participants reported exchanging text messages with friends and family, even if they saw each other face to face on a daily basis. These ICT devices gave participants control over how and when they communicated with others. Some participants recognized that it was possible to adapt the way they interacted with others to their preferences using this tool. In one case, a participant reflects on the possibility to send only short voice or text messages through WhatsApp without having to engage in long conversations on the phone:

"I had one of those telephones just to call (...) but my children bought this smartphone for me and I thought... 'Why would I want this?', 'For what would I use it?' I just wanted to have a telephone to receive calls and nothing more. But when they showed

it to me and for what it is for, my mind changed. (...) To be able to speak in just an instant and then they answer back (...) Sometimes you call, and you have to be there for a whole hour speaking on the phone. But in this way, you just send the WhatsApp [message]... you say what you want, they answer back, and its done”. (María José, 70, lives with spouse and son, SCD).

In this way, ICT devices provided the opportunity for participants to manage their social contacts and communication with others. The use of WhatsApp is a good example on how ICTs offer new ways of communication for older adults living with cognitive decline. These kind of ET resource allows older adults to access other resources, such as contacts with family and friends, in order to achieve the functioning of being socially active.

### **5.3. The capability to live at home using ET**

This section presents a collection of valued uses of technology developed at home by the participants. These functionings were identified through the analysis of values associated to ET devices at home and how participants choose to use them. These themes aim to illustrate what is valuable about the use of technology in everyday life for older adults living at home. Together, the description of these functionings illustrates how ET resources are available for the capability to live at home in the context of cognitive decline.

#### **5.3.1. To simplify household tasks**

Participants described the use of ET devices for various activities of housekeeping, such as vacuum cleaning and cooking. In these references, simplicity of use was regarded as a valued characteristic of certain devices that helped participants to engage with daily activities at home.

“It has been 50 years since I have a washing machine, and I know that I have to press ‘here and here’ to use it. To begin with, I look forward to a washing machine that is easy... I mean, don’t show me a panel with 50 options (...) Then what I want is “this cycle of wash”, “this temperature”, add the detergent, “this and that” and plug it... I don’t want to use something too sophisticated (...) And this is getting harder because nowadays everything is more like the internet...” (Ignacia, 76, cohabits with spouse, no SCD/MCI).

Ignacia values the fact of having a washing machine that does not offer too many options that could confuse her. This allows her to do laundry in a simple and regular way, as she grew used to do it. More complex or “smart” devices, i.e. that are connected to the Internet, are seen as difficult to incorporate in daily activities. In other cases, participants referred to the ways some ET devices could simplify tasks such as heating meals:

“(…) the microwave is also very useful. Instead of using the kitchen’s fire, you use it (the microwave) to heat the milk or when I realize that I’ve forgotten to take out the bread from the freezer... but then you just unfreeze it there and you can use it”. (Josefina, 74, cohabits with spouse and son, MCI).

Josefina values having a microwave as an alternative to the kitchen stove. She considers that using the latter is more dangerous since she sometimes forgets to put it off completely, leaving the gas supply on. The incorporation of new and more modern devices also offered the opportunity to simplify housekeeping. A good example of this was the use of vacuum cleaner robots:

“I have a very potent vacuum cleaner, very good... but the thing is you have to first get it out, mount it, pull the cord, and that kind of things, and since I am alone and I barely dirty my house, I say it again... the robot does its job and cleans [the floor] in a trice, and I don’t have to move it, it moves on its own...” (Antonia, 76, lives alone, SCD).

Antonia appreciates the automatization that the robot offers to vacuum cleaning. This device is seen as simpler and easier to utilise than a traditional vacuum cleaner. Nevertheless, she mentioned having to spend some time learning how to clean and charge the device before she could feel comfortable enough to use it regularly.

These examples show how participants negotiate their use of ET and daily routines for household tasks. Some participants, especially those who live alone, described doing little housekeeping because they did not have the energy to clean their homes more thoroughly. They preferred hiring cleaning services once in a while or relied on the help of family caregivers. ET in this sense has the potential of becoming a helpful resource in facilitating these tasks in a context marked by cognitive and physical decline. Older adults can use the same old devices they are used to or replace them by much newer and unknown ones in order

to make daily tasks simpler and more achievable. The influence of personal conversion factors in these examples can be seen through the motivation to learn how to use a new device or the preference to keep older and better-known devices.

### **5.3.2. To engage in leisure activities at home**

Throughout the interviews the role of ET in leisure activities considered important for well-being at home became noticeable. Participants also indicated they experienced changes in how they engaged in these activities after adopting ICT devices such as mobile phones. The most common activities where participants identified the presence of ET devices were watching TV, listening to the radio or music and reading. About the role of ET devices in engaging in leisure activities at home, participants valued the possibility to access content according to their preferences. Enric explained how television offered a space of relief from his memory problems. He described watching TV as an activity that allowed him not only to entertain himself but also to relax and not being too worried about not remembering what he saw:

“(…) The television has one thing that I like, I watch it because I forget all of it. I forget all [what I watch at] the television, right away. And have a conversation with the television ... no. (...) It's impossible, because I do not... what I really like is the football report, I heard a journalist speak ... I only hear, but I think "well and what, tomorrow will I remember something?" Well, I do not know. And that's how it is.”  
(Enric, 84, lives with spouse, Moderate Cognitive Impairment due to vascular reasons).

It was difficult for Enric to accept not being able to remember the conversations he had with people in his daily life. While watching TV, he did not feel the pressure of having to remember everything that was being said, allowing him to feel more relaxed. It is possible to see in this example how the evaluation of an ET resource, in this case the TV, is affected by personal characteristics of the participant. In the context of cognitive impairment, watching TV acquires a new meaning to Enric, associating it to coping with having memory problems. For other participants, ET had the ability to allow them to feel accompanied in their daily lives when engaging with them for leisure purposes, especially for those who lived alone. Radios and TVs played an important role in this, as they were considered the main source of

entertainment and information in the home. In the following example, Ignacia explained how she uses the radio to feel accompanied in the kitchen and to fall asleep at night:

“I have one (radio) in the kitchen because I like to hear someone while I’m there (...), I have this small radio at the night table and sometimes I wake up at 4 a.m. (...) and then I put on the headphones and search for something, maybe a nice interview (...) Instead of taking a [sleeping] pill, I wake up at 4 a.m. and with a bit of luck I may find a nice interview and then you relax, because falling asleep is to relax yourself, so it must not be something that excites you too much... and then I fall asleep”. (Ignacia, 77, lives with spouse, no SCD/MCI).

These examples illustrate how some ET devices mainly used for leisure activities also offered opportunities for well-being at home beyond entertainment. In the last example, using the radio to fall asleep implies the choice of not to use a sleeping pill for the same purpose. Participants could adapt the use of these devices to different contexts. In some cases, the use of headphones while listening to music and radio emissions allowed participants to not to bother neighbours or other inhabitants of the home. Or as in the case of Enric mentioned before, the use of these devices for entertainment could be re-interpreted as a way of coping with some aspects of cognitive decline.

Some of the participants that did not show difficulties for using ICT reported changes in the way they engaged with leisure activities such as reading the news or looking for information on the internet after acquiring smartphones. In these cases, after learning how to use the device and feeling more capable of utilising them for new activities, participants reported starting to use the smartphones instead of the computer to look for video tutorials or to read different news outlets instead of buying the newspaper. These changes could be interpreted as a way in which participants condense leisure activities possible to carry in different devices into one device, the smartphone.

### **5.3.3. To enable a sense of safety at home**

Another identified functioning related to ET use was that it enabled a sense of safety. For in-home safety, some participants reported using a necklace alarm provided for free by the Municipality of Barcelona. This device allowed them to ask for help in case of an emergency or fall inside the home. Some of the participants wore the device at all times inside the home

while others kept it in a place where they could feel safe and was easy to reach e.g. a night table next to their beds. The device works by pushing a red button that connects a call with the emergency services from anywhere in the home. This example illustrates how ET resources are shaped by technological conversion factors such as the presence of a Municipal program to provide alarms for free to older adults.

In another example, a participant modified the way he saves contacts in his mobile phone, in order to have emergency and close relatives' numbers in the first places of his phone agenda, to make it easier for people assisting him to warn them in the case of an accident:

“(...) Then in my phone, I have put my nephew's number as priority (...) This is very interesting because something can happen to you on the street (...) I put two or three 'A' [letters] before the name so the assistance can call my nephew or this other friend, who are the two people I trust the most, so if something happens to me, they can call them”. (Arnau, 82, lives alone, SCD).

In this example, Arnau adapts the use of an ICT device to be prepared in case of an emergency to allow easy contact with trusted ones. This process of individualization of the use of technology is possible thanks to the knowledge that Arnau has about how a smartphone works, which is a personal conversion factor. Through these uses of ET, participants could actively manage risks associated with living with cognitive impairment and maintain a sense of security in their daily lives at home.

#### **5.3.4. To enable a sense of independence at home**

For participants living with MCI, the use of ET could allow them to create a sense of independence in their daily routines. This happened despite the presence of family caregivers who would take care of a wide range of the participant's needs. One of the clearest examples was Carlota. Her daughter, an older woman herself, lives nearby and takes Carlota every day to the Day Care Centre, where she spends every weekday morning. Carlota's daughter also does her shopping and arranges her medical appointments. Carlota explained that she engaged in housekeeping and cooking to not overwhelm her daughter with those tasks:

“(...) I cook for myself. She [my daughter] is also a widow (...) We are both widows and she is alone at her home, and I live alone at mine. I could go to live with her, but I don't want to, because she has two daughters... and when one of them doesn't need

her, the other does... (...) And myself, as her mother, I try... because I am in very good shape, you know? (...) I don't want to bother her too much, you know? I try to... I wash my own clothes and then I hang them, I cook for myself and take care of the kitchen stove... 'Mom, the stove' she's always worried about the stove, "I'll keep an eye on the stove" [I respond]. I have to turn around and turn it off, because I left it open once." (Carlota, 83, lives alone, MCI).

Carlota tries to give her daughter some peace of mind when using potentially dangerous ET devices such as the kitchen stove. At the same time, she values the fact of being able to engage in daily tasks independently and to live in her own home. Later in the interview she would explain that sometimes she sometimes feels inside a "golden cage", where she is not allowed to do much on her own. Through her engagement with ET, she struggles to maintain a more autonomous way of life and to limit the influence of her caregiving daughter in her everyday life.

In other cases where participants reported having MCI, to be able to use ET conveyed meanings of usefulness and the ability to participate independently in the life at home. The case of Enric, is a good example of how the use of ET can provide to older adults with cognitive impairment the capability to actively participate in life at home in their own terms. He reported not being able to speak on the phone anymore due to his hearing problems. He had to use a microphone connected to a headphone set to have more complex conversations with people. His spouse helped him to put the device on when she needed to tell him something important. Enric did not have much control on when and how to use this device. However, he reported still answering the phone when nobody was around to let callers know that he would warn his wife:

"Interviewer: So you help [your wife] to know that someone called?

Enric: Yes, when someone calls me (...) I pick up the phone, I say "do not call me anymore, I'll tell [my wife] to call you when she gets here". (...) I say, "do not worry, if it takes too long, because [my wife] will take time to come, be calm, when she comes, I'll tell her you've called me". And she will [later] pick up the phone and see the number and call back." (Enric, 84, lives with spouse, Moderate Cognitive Impairment due to vascular reasons).

To be able to use the telephone under his own terms, provides the opportunity to Enric to perform an active role in the life at home. In this case, the telephone and hearing aids together enable Enric's agency, promoting a sense of independence through the task of answering the phone. This example illustrates ET resources influence each other in the achievement of valued functionings, in this case, to enable a sense of independence at home.

### **5.3.5. To enable mobility in- and outside the home**

Mobility in- and outside the home emerged as an important aspect of life at home using ET. During the interviews, three participants mentioned having a car, but when the topic of out-of-home mobility was addressed, most of the participants also mentioned using the public transport system. Only two cases reported having to use a cane or home modification (shower handle) to move inside the home, this echoes the absence of important physical impairments in the sample composition. In these descriptions of out-of-home mobility, Barcelona was regarded as a well-connected city, with a transport system that was easy to engage with. Most of the participants used a special card given by the Municipality to people aged 65 or more, that allowed them to travel on buses and subway at a reduced price. Some of them had to stop driving because of their cognitive condition or because they could not afford to have a car anymore after widowhood or retiring. In those cases, participants reported using the public transport system or asking family and friends to drive them to places.

When asked about what devices they think could be useful to them in the future, some of the participants could identify devices that could help them to cope with physical disabilities or mobility problems. Arnau reflected on this topic in the following way:

“Arnau: A device that would be useful [to me] in the future?... I hope it's not an electric wheelchair or a walker, but I would not want to stay inside my house all day, if you see yourself impaired or mildly impaired in the last years of your life, a thing like that facilitates your mobility.

Interviewer: and is there something you think it's going to be less useful in the future?

Arnau: The car, I think...” (Arnau, 82, lives alone, SCD).

Arnau's reflection illustrates how the projection of his own ageing process implies a change in the set of resources that ET can provide. It also illustrates how ET devices related to

mobility can enable the access to other resources “outside” the home despite the expected physical impairments. The personal factors associated with this process; an increased physical impairment and the continuity of a desire to remain active, will shape the role of ET devices in his daily life. New devices such as rollators could become useful, while devices already present, such as the car, will lose utility due to its complexity and demand for physical capacity.

#### **5.4. The capability to engage with ET in the context of memory issues**

When asked about their engagement with ET in the context of having memory issues, participants explained how they developed strategies to cope with forgetfulness and to manage cognitive decline using ET. Using these strategies, participants were able to achieve functionings regarded as personal goals, such as feeling more comfortable using ICT or learning new skills. These strategies resulted in functionings that helped participants to compensate for memory problems, comply with expectations about their cognitive capacity and engage in cognitive stimulation activities independently. These functionings can be considered as the result of the choice to exert the capability to engage with ET in a context of changing cognitive capacity. This section will also address the participant’s reflection on the effect of dementia as a diagnose in the capability to engage with ET. Participants were specifically asked to reflect on the usefulness of ET in the context of cognitive impairment. These reflections illustrates the opportunities participants identify for coping with cognitive changes at the onset of cognitive impairment.

##### **5.4.1. To develop new skills and personal goals**

For some of the participants, engaging with ET devices was regarded as an opportunity to put into practice valuable skills gained throughout the life course, especially during their working life. María José, a woman that worked in a textile factory, described her sewing machine as one of the most important ET devices in her home. For her, having this machine at home helps her to engage in a patchwork sewing workshop at a local community centre. As she wanted to develop new interests after retirement, she explored new ways of using her sewing machine:

“(…) Yes, [after retiring] I wanted to learn new things. And now I am attending a patchwork workshop (…) I didn’t know how to do that and I was very interested in

learning so I could use my sewing machine. Then, I started coming to this workshop (...) the idea is to sew it by hand, but using the machine I can do it much faster!” (María José, 70, lives with spouse and son, SCD).

Having this device at home allows her to put into practice new skills related to her previous work. In this example, it is possible to see how ET can allow participants to engage in valuable activities and to manifest valuable skills in their daily lives. The personal conversion factor of having interest in learning becomes crucial in the strategy that Maria José puts in place to engage with ET for the purpose of learning new skills.

#### **5.4.2. To participate in learning activities at the local community centre**

The participation in community centres was regarded as an opportunity to engage in social contacts with other older adults and in training for ICT use. The Recreational Community Centre offered memory workshops along with ICT courses where members could go and learn how to use mobile phones and computers. According to the participants, these courses provided them with the confidence to use ICT devices by learning how to operate them and to practice using them. In many occasions, participants said they did not know how to take “full advantage” of these devices. In five cases, this was identified as the main motivation to engage in ICT workshops. One participant with MCI felt unfamiliar with current ICT due to his own personal experience of retirement before digital technologies became ubiquitous in working environments. The training helped participants to use smartphones for calling or using WhatsApp and looking for information on Google or sending e-mails in the case of computers. These were regarded as valuable activities that allowed participants other functionings such as staying in touch with loved ones and being informed. This last functioning also allowed participants to access platforms such as YouTube, opening them the possibility to access entertainment videos and tutorials for problem-solving. Ignacia reported that she first became interested in the centre’s activities because of the memory workshops, but later she decided to enrol in other activities including ICT workshops:

“It’s been a year since I started coming here, somebody told me... I think it was a neighbour ‘you should go to the [community centre] there are plenty of things to do there’. I wanted to do something, I didn’t like to be all day at home (...) so I signed

up [to the memory workshop] and I liked it. And then I also signed up to the internet course, to know more”. (Ignacia, 77, lives with spouse, no SCD/MCI).

This example illustrates how participating in community centres for older adults can facilitate the achievement of other functionalities such as socialization and engagement with ET. The presence of local community centres and the social norms regarding these places as valuable socialising spaces for old adults can be interpreted as environmental and social conversion factors, respectively.

Additionally, the Recreational Community Centre created socialising opportunities that are linked with a functioning of remaining socially and cognitively active. Some participants considered that their attendance to these workshops played a crucial role in their ability to control cognitive decline. Eugenia sees a double benefit of participating in these centres, as they offer the opportunity to socialize and remain active:

“(…) the worst you can do is to stagnate (…) to remain still and do nothing, that is very bad, as long as you keep doing this [participating in memory workshops], the way you move, the people you speak with… like here in the [community centre], that is why I come here, because you see a lot of people, you can speak with everyone and that makes your head, your memory, to get better” (Eugenia, lives alone, SCD)

The conversion factor of the Community Centre offers the opportunity to learn, thus facilitating access to ET resources in daily life. Other participants pointed out that their participation in the ICT workshops also helped them to develop a sense of safety when engaging with internet browsing. Some of them were afraid of sharing sensitive data online, fearing negative financial consequences. Through the participation in this workshop, participants wanted to increase their ICT competence and independence. This shows how the social context of adults with cognitive decline can offer opportunities to engage with ET and to develop new skills for the use of technology. This results in an increased set of opportunities for access to technological resources and the production of a personal identity as an older adult capable to engage with ICT.

#### **5.4.3. To help oneself to remember things**

Participants who had problems remembering appointments or details about certain daily tasks, such as shopping or housekeeping reported acquiring the habit of writing things down.

Usually, they destined a small notebook by the telephone or a calendar in the kitchen to annotate important messages or dates. This practice was associated with the onset of SCD and perceived changes in social relationships. Carme explained how she developed the strategy of writing important things on a calendar when she started having arguments with her husband because of her memory problems:

“My husband got mad sometimes (...) he used to tell me ‘you are not paying attention!’, ‘I told you we were going to do this today, we spoke yesterday!’ Sometimes I woke up and asked myself ‘what were we going to do today?’ (...) so I started using a calendar for this, as a proper old person. If I had a doctor appointment or I had to accompany someone or my grandchildren were going to pay me a visit [I wrote all that]. I explained to my husband that it affected me to see him mad at me, so I would try my best to pay attention and he also changed his attitude” (Carme, 70, lives with spouse, SCD)

She described using the calendar, also a piece of ET, as a way of achieving the functioning of remembering things and to comply with other’s expectations about cognitive performance. Carme associated this decline with the ageing process, describing the use of reminders as something that a “proper old person” would do. In another example, Eugenia explained how she started writing down important things when she felt forgetful and received recommendations from her daughter to develop a mnemonic strategy:

“Since I started to realize I was forgetting stuff, the solution was to write things down, to write and see them [later] and that’s it. Because I can still read, it’s just a matter of writing and reading, nothing more, at least for me. (...) My daughter, the one I told you was a doctor, she said to me ‘you have to write things down and later check them’ She’s also the one that watches over this [my memory] because if this got worse, I don’t know what else I could do, but for now there’s no problem.” (Eugenia, 76, lives alone, SCD).

In these examples ET in the form of notebooks or calendars help participants to cope with memory deficits and to solve problems related to their exchanges with other people. In this sense, the use of ET allows for the normal flow of daily life despite de onset of memory problems.

When participants were asked how technology could be useful to persons having memory problems this condition was associated with dementia. Some participants thought that older adults should engage with technology if this brought them benefits such as slowing their cognitive decline. However, when somebody received a diagnosis of dementia, their capacity to engage with ET was regarded as severely diminished. Carlota, living with MCI herself, reflected on this decrease in capacity to use technology and the consequent increase in need of care:

“Carlota: very bad... if you don't have memory, you have to be very careful, you have to have somebody in your house to take care of you and to cook for you, because if you are not able to think, then you will have trouble, you know?”

Interviewer: And can you think in any way that technology could be useful to a person like that?

Carlota: To have more memory... because it's the same that happens to me with the stove, the whole house can explode, and with the washing machine, if you don't know how it goes... how do you turn it on? You would have to wash by hand...” (Carlota, 83, lives alone, MCI).

According to these examples, the capability to engage with technology at the onset of dementia is dependent on personal conversion factors. The cognitive capacity is regarded as an important personal conversion factor that could enable the access to ET resources at the onset of dementia. Carlota's reflection also points to the increase in social support that a person with this condition would need. This illustrates the importance of social conversion factors of support and care for older adults with dementia to access the necessary resources for well-being. To practice consistently when engaging with new ET devices and the openness to learning were also identified as key characteristics of cognitive capacity to ensure opportunities to use technology.

#### **5.4.4. To engage in cognitive stimulation activities independently**

Some participants reported engaging in cognitive stimulation activities in their daily lives using ET and ICT devices independently from memory workshops, specially at home. These activities could take the form of playing games on a computer, solving puzzles or reading

and were often associated with leisure. Antonia explained how she liked to buy books with puzzles to “exercise memory” in her free time:

“At home I do things for my memory, when I feel like it and I’m a little bit bored, I take a book with puzzles, word puzzles (...) I start completing the phrases, these books, they are everywhere in kiosks! (...) I have the same in my tablet, I also have a game like that there but it is with numbers and you have to attain the highest number possible I think I don’t know well the technique [to win the game] (...) and that distracts me a lot”. (Antonia, 76, lives alone, SCD).

This example show how leisure activities involving different ET devices (puzzle books and tablet games) can be re-interpreted by older adults as cognitive stimulation activities in the context of cognitive decline. In another example, Gemma explained how she considers that playing cognitive stimulation games on ICT devices can be of help to older people having memory problems. Nevertheless, she considered that the benefit that a person can get from playing such games depended greatly on personal characteristics and cognitive capacity:

“I think a tablet [can be of help], yes... on the tablet you can have drawings and other simple stuff (...) it should always be something simple, a program that is easy to use... it will depend also in your abilities from here [points to her head] and how much studies you have”. (Gemma, lives alone, SCD).

This example show how the opportunity to engage in cognitive stimulation activities also depends on personal conversion factors such as level of education and cognitive capacity.

## 6. Discussion

### 6.1. Introduction

This research aimed to analyse the role of ET in the capability set of community-dwelling older adults living with SCD/MCI participating in cognitive stimulation environments in Barcelona. The capability approach, as a theoretical framework was used to interpret participants accounts of their valued beings and doings related with the use of technology. Through in-depth interviews, this research identified how older adults navigate and negotiate the use of technological objects. These uses were then interpreted as functionings that older adults strive to achieve as expressions of valued capabilities in later life in the context of cognitive impairment.

The three sub-questions of this study will be addressed by a) analysing the way that participants value the ET resources available to them, b) analysing the choices participants make in their strive to achieve valued functionings and c) the influence of conversion factors in the evaluation and use of ET resources. Table 2 shows a summary of the findings conceptualized as the main components of the CA.

Table 2: Findings conceptualized as components of the CA

Resources	Conversion factors	Capabilities	Achieved functionings
<b>Community centres</b>	Environmental: well-connected urban environment	Being able to use ET in daily life	To adapt preferences to own possibilities
<b>Digital games and apps</b>	Environmental: presence of community centres	The capability to live at home using ET	To ask for help for 'technology experts'
<b>Electric wheelchair</b>	Personal: cognitive capacity	The capability to engage with ET in the context of memory issues	To not to engage with certain ET devices
<b>Hearing aids</b>	Personal: knowledge on how to engage with ET in a versatile way		To manage social contacts through ICT
<b>Hiker's watch</b>	Personal: motivation and openness to learn new things		To simplify household tasks
<b>ICT devices (smartphones, tablets, computers)</b>	Personal: not knowing how to take advantage of ICT devices		To engage in leisure activities at home
<b>ICT workshops</b>	Personal: phisycal capacity		To enable a sense of safety at home
<b>Instructions manual</b>	Personal: preferences rooted in individual life course and current condition		To enable a sense of independence at home

<b>Internet connection</b>	Personal: to strive to live an independent life		To enable mobility in- and outside the home
<b>Memory workshops</b>	Personal: to adapt preferences in using technology		To develop new skills and personal goals
<b>Necklace alarm</b>	Social: social norms about older adults and technology		To participate in learning activities at the local community centre
<b>Cars</b>	Social: expectations about cognitive capacity in old age		To help oneself to remember things
<b>Physical money</b>	Social: help of caregivers for housekeeping		To engage in cognitive stimulation activities independently
<b>Public transport system</b>	Social: help of others to be driven around		
<b>Radio with headphones</b>	Social: trust in local community		
<b>Reminders (calendars and notebooks)</b>	Social: trust in technology service providers		
<b>Rollator and canes</b>	Technological: alarm service for older adults		
<b>Sewing machine</b>	Technological: new automated devices		
<b>Trusted 'technology experts'</b>	Technological: special public transport card for older adults		
<b>Vacuum cleaner robot (vacuum cleaner)</b>			
<b>WhatsApp</b>			
<b>White goods</b>			
<b>YouTube</b>			

Throughout the analysis, it was possible to identify how ET devices play a crucial role in the daily lives of older adults in Barcelona as a type of resource that offers both opportunities and obstacles to achieve valued functionings. As a resource, ET is subject to the influence of conversion factors that enable or restrain older adult's access to it. Furthermore, it became clear that the process of ageing is an important factor that influence how to engage with ET devices. This follows the idea proposed by Gilleard (2017) that aged individuals who engage in the use of technology are embedded in social norms around age and technology that portrays them as passive users of technology. Some ET devices, specially ICT can be regarded as objects that require great effort and motivation from older adults in order to make use of them in a meaningful way. Older adults evaluate their own capacities and opportunities to manage these difficulties and to benefit from what ET resources have to offer. In this sense,

older adults establish a dialectical relationship with ET , through which individuals become “technogenarians”: agents capable of actively and creatively using technology (Joyce & Loe, 2010a, p. 1). In this sense, ET devices can work as vehicles for older people’s agency and at the same time, they are being shaped by history and the social structures in which the individual is positioned (Gilleard, 2017; Joyce & Loe, 2010a). The context of cognitive capacity change presents new challenges and risks to older adults that are subject to a rapidly changing technological landscape (Malinowsky et al., 2015). The appearance of new and more complex devices was one of these risks, as well as the perceived changes in cognitive capacity and social relationships due to memory problems as one of the most important challenges.

## **6.2. The experienced value of ET as a resource for capabilities in later life**

The ET devices present in the participant’s daily life did not vary too much from case to case. They included white goods and house appliances and ICT devices such as computers, mobile phones and tablets. Furthermore, two classes of resources could be identified: general ET resources such as white goods, aids, means of transportation and pharmaceuticals, on the other hand, and ICT resources on the other. The latter were regarded as more complex to use than general ET resources. Participants thought that they belonged to a generation that was not sufficiently in contact with ICT devices/resources during adult life. Other studies have shown that familiarity with ET is a process that develops during the life course and can have implications for technology adoption in later life (Selwyn, 2004; Taipale et al., 2018). Some participants identified the existence of a process that blurred the difference between ICT and ET devices. This process has been called “digital revolution” in research about the relationship between older adults and technology in the context of the emergence of the Internet of Things (IoT)<sup>3</sup> (Schulz et al., 2015), in which digital devices replace analogical devices in the daily lives of older adults.

The participants of this study considered devices such as notebooks or calendars to cope with forgetfulness or the use of puzzles books for cognitive stimulation as more accessible resources than other newer and digital resources.

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<sup>3</sup> The Internet of Things refers to a process in which ET devices become digital and increasingly connected with the Internet allowing for the remote operation and management of their functions.

The evaluation that participants did of their ET resources depended on their considerations about the aging process and their personal life histories of technology use. A “generational divide” between them and younger generations in the level of knowledge necessary to engage with ever more complex ET and ICT devices was observed. This is in line with the literature about the digital divide between generations, in which older adults report feelings of disempowerment and perceptions of low self-efficacy when engaging with ICT in a context where ET increasingly is integrated with the Internet (Choi & DiNitto, 2013; Hill, Betts, & Gardner, 2015). This specific evaluation also served as motivation for engaging in learning activities in order to utilise ICT devices through the engagement in learning environments as a valued functioning.

Additionally, ET resources had the potential of expanding the capabilities of older adults and, at the same time, in some cases interacted with other types of resources changing how older adults used them. This is an expression of the transformative capacity of ET resources in the technology-enhanced CA model (Haenssger & Ariana, 2018). For example, saving the instruction manuals of certain devices, participants felt they were more capable of solving problems related to the use of ET. These manuals affected the characteristics of other devices, rendering them more accessible to older adults. Barnard et al., (2013) have identified this specific resource as a crucial element in successful technology adoption in older adults.

The context of cognitive capacity change presents new challenges and risks to older adults that are subject to a rapidly changing technological landscape. In the participants views, a diminished cognitive capacity meant a reduction of the usefulness of most ET resources, making necessary the use of social support and care to function in daily life. This result contrasts with the conclusions of Malinowsky et al. (2015) that identified, through a quantitative longitudinal study, a perceived increase in the relevance of ET resources for daily life activities among older adults with and without cognitive impairment, and a higher perceived difficulty of ICT devices in both groups. The findings of the present study foregrounds the importance of attitudes towards the use of technology in later life for the evaluation of ET resources. Other studies have identified that the level of perceived ease of use of ET resources is an important factor for technology adoption in later life (Peek et al., 2014). The social norms about the ageing process can negatively influence the way older adults see their capabilities to use technology in a meaningful way in the context of cognitive

impairment, even though the relevance of ET resources in daily life continues to increase as technology develops further.

### **6.3. The achieved functionings of older adults in the context of cognitive impairment.**

Achieved functionings, as the translation of opportunities into beings and doings, are central for the understanding of ET in the capabilities in later life. Participants described the different purposes for which they used ET in their daily life and this was interpreted as the set of achieved functionings of the participants. These purposes can be linked with the idea of beings (to participate independently of life at home and to feel safe) and doings (simplicity of use, social interaction and participation and to cope with cognitive impairment) that constitutes the concept of functioning in the CA.

Participants valued the opportunity to get to know the devices in deep before feeling comfortable using them, this is in line of what was found in the study of how older adults with cognitive impairment engage in learning strategies to use ET (Rosenberg & Nygård, 2016). In the case when ET devices were regarded as complicated to use, participants choose specific purposes for the use of ET and ICT. In the case of ICT, some similar results have been found in the Spanish context, where male users tend to only manage social life through the smartphone use whilst female users replace face-to-face socialization practices through these devices (Hernández-Encuentra, Pousada, & Gómez-Zúñiga, 2009). In the case of general ET devices such as white goods, the purposes were rooted in routines carried out along the person's life history. In the case of ICT, the purposes were acquired much later and could be constructed thanks to the aid of younger generations or technological experts inside participant's social networks.

The use of the CA allowed to produce insights into the values that guided the achieved functionings of older adults when using technology. To cope with cognitive impairment was one of the most important, as it was present in various functionings related to changes in social relationships and the management of cognitive capacity decline. Participants executed their agency as the choice to engage in the memory workshops to cope with cognitive decline. Participants of this research did not describe the specificity of their cognitive conditions with the labels of mild cognitive impairment or subjective cognitive decline but rather addressed

this topic with descriptions of memory issues. Nevertheless the implementation of coping strategies in the context of changing social relationships and psychological difficulties is similar to what other studies have found with participants using or more aware of their condition diagnoses (Berg et al., 2013; Joosten-Weyn Banningh, Vernooij-Dassen, Rikkert, & Teunisse, 2008)

#### **6.4. The influence of conversion factors in the evaluation of ET resources and the achievement of functionings**

It was possible to identify a series of conversion factors exerting influence on the way that older adults evaluated and utilised their available ET resources. The conceptualization of conversion factors used in this research classifies these influences in personal, social, environmental and technological (Haenssger & Ariana, 2018).

In the case of personal conversion factors, personal characteristics such as motivation to use the devices, to lead an independent life and the openness to learn new things related to the use of ET and ICT were salient. These conversion factors were where regarded by participants as facilitators for updating technology or to start using a new device that would be considered more complicated. Having motivation and openness was regarded as a way of overcoming the influence of the personal conversion factor of not knowing how to take advantage of ICT devices, for example. This has been observed in other studies on the subject, where participants describe how a sense of need and usefulness of the device is crucial to start using a new device in the context of cognitive impairment (Hedman et al., 2016; Nygård, 2008).

In the case of social conversion factors, the access to ET and ICT was greatly facilitated by the presence of younger members of the family and trusted ET providers. These actors are part of the social context that surrounds older adults in their daily lives. These findings are in line with other research that points to the importance of social and intergenerational solidarity in the access of older adults to ICT (Taipale et al., 2018).

Social norms about the ageing process and the characteristics of the cognitive condition influenced how participants regarded technology and their purposes. Forgetfulness was regarded as a characteristic of the ageing process and prompted the need to engage with technology with mnemonic purposes. Beard and Fox (2008) interpret this as a process of

incorporation of forgetfulness into older adults' self-identity. The onset of dementia was seen as a major obstacle for the engagement with any type of technology, as this condition was seen as the cause of a complete depletion of cognitive capacity. These ideas respond to a social construction of advanced age and dementia in modern societies, where the prevalence of this condition among ageing older adults is increasing (Prince et al., 2013; Vega Alonso et al., 2018). As a result, advanced old age becomes increasingly associated with lack of agency and dementia morbidity, creating fears of incapacity and dependence in the population (Gilleard & Higgs, 2010).

In the case of environmental conversion factors, the presence of community centres (RCC) greatly influenced participants' access to ET resources and technological self-reliance through the participation in ICT training courses. These spaces also offered socialisation opportunities in the local neighbourhood. This is in line with the valuation of learning environments as an important resource for well-being in later life identified by Gilroy (2007) for the UK context. The availability of memory workshops also contributed to the idea that personal cognitive capacity could be maintained or improved, thus illustrating the way different conversion factors can interact with each other.

Finally, the influence of technological conversion factors could be identified through the presence of the alarm program orientated to older adults living alone and in the development of new automated ET devices. These characteristics of the technological context influenced the achievement of functionings of enabling a sense of safety and simplicity of household tasks. Other conversion factors play a key role in this process, such as the openness to new devices and the possibility to rely on social support. Other capability studies have pointed to the centrality of the capability to feel safe in familiar environments (Meijering, van Hoven, & Yousefzadeh, 2019) and to achieve simplicity in the use of ET (Hedman et al., 2016) for wellbeing in later life.

### **6.5. Study limitations and further research**

This section aims to reflect on the limitations that this study encountered and the future research questions that can emerge from the findings. The methodology used in this study allowed the researcher to explore the set of achieved functionings that served as indicators of valued ET-related capabilities in later life. Nevertheless, the conditions for data

production, i.e. that the participants could only be interviewed once and that the interviews had to be carried out in the recruitment centres' facilities, limited the possibility to delve deeper into the practices of older adults using technology. A combination of interviews and participant observations could yield rich data on how older adults relate to technology in the context of cognitive impairment, as other studies show (for an example see Nygard, 2008).

Additionally, a mixed methods strategy could also generate the possibility to implement more versatile strategies to address the complexities of doing research with persons living with cognitive impairments. In the cases where the participants lived with MCI in the present study, a second interview would have been useful to explore deeply relevant values and uses of technology. Reviews on the topic suggest that to privilege the voice of this type of participants, it is recommended to have multiple contacts with the participant and to spend more time building a trust relationship with them and their caregivers than in other fields of qualitative research (Hubbard, Backett-Milburn, & Kemmer, 2001; Hubbard, Downs, & Tester, 2003; Nygård, 2006). Such a strategy could also be useful for the study of technology and capabilities with participants in more advanced stages of cognitive impairment.

Another limitation is related to the study sample composition. As it was composed mainly of older women with MCI or SCD, with only two cases of male participants living with MCI, not enough data was produced to analyse gendered practices in the use of ET. During the analysis of the data, the researcher was able to identify some differences in the way male and female older adults referred to ET devices in their daily lives. Male participants tended to focus more on devices used for work and leisure activities, while female participants addressed the topic through references to household activities. This difference was not present in the case of the male participant living alone with SCD. Nevertheless, this difference was not well addressed in all the interviews and the researcher decided to exclude this line of analysis from the data processing. A study with a more balanced sample of participants could yield more insights in the gendered differences of the role of ET in the capabilities of older adults. Other studies have found differences between the genders in use of ICT devices in the Spanish context, pointing to the possibility of different valued technology-related capabilities in later life (Hernández-Encuentra et al., 2009; Rosales & Fernández-Ardèvol, 2016).

The ET devices present in the participants' descriptions of daily life did not vary too much from case to case. They included white goods and house appliances and the most common ICT devices (computers, mobile phones and tablets). This could be related to the setting of this research: the affluent urban context of Barcelona. Other studies have encountered similar results in high-income societies (Malinowsky et al., 2015). An ethnographic methodology could yield more insights into ET use and valuation in specific contexts such as households of different socio-economical levels or more deprived rural areas, where access to ICT resources tend to be centralised in community centres or are in general less accessible (Oosterlaken, 2012).

Finally, this study opens the possibility to study one of the three specific valued capabilities identified. These studies could discuss in-depth with participants what is needed to be able to translate these capabilities into functionings or what are the reasons to value any of them. Other similar studies have addressed capabilities in later life directly in this form on topics such as independence (Meijering et al., 2019), evaluation of supportive environments (Gilroy, 2007), healthcare access (Haenssger & Ariana, 2018) and mobility (Green, Jones, & Roberts, 2014).

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## 8. APPENDIX I: Interview guide (English)

Name of participant	
ID of participant	
Gender	
Age	
Marital status	
Living arrangement	a) Single b) Cohabiting a. With whom?.....
Type of home	a) Detached home b) Paired home c) Apartment
Current vocational activity	
Educational level attained	
Profession	
Diagnosis	a) MCI b) Early-stage dementia c) Dementia due to vascular reasons d) No diagnosis
Time since first diagnosis	
Attends a memory workshop?	a) yes b) no

- a) Is your first time participating in a memory workshop? (*If it is not the first time, ask how many times in the past or for how long they have attended one*) How were the previous times? Where did you attend these workshops?
- b) What led you to make the decision to enroll in a memory workshop? Did anyone else participate in that decision?

- c) What kind of activities do you carry out in the workshop?
- d) Are there activities that you have to do at home? What are they about?
- e) What do you hope to obtain from your participation in the memory workshop?
- f) How long have you lived here? Why did you choose to move here at the time?
- g) What does it mean to you to live here?
- h) What, according to you, is important about living at home?
- i) What is what you like the most about your home?
- j) What is what you like the least about your home?
- k) What are the objects/devices you use the most in your daily life? Could you think of at least 10 of these devices? (*Especify: technology as any device that helps people to live their daily lives/ probe: electronic devices such as smartphones and tablets, technical devices such as hearing aids, mechanical devices such as rollators*).

Name of Device	Location at home
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

9.	
10.	

Probe:

- How did you get these devices?
- How did you learn to use them?
- How do you prepare yourself when you want to use them?
- Could you try some of these devices before acquiring them?
- For what do you use these devices? (*probe: leisure, to be in touch, as memory support, to move around*)

h) What do you think about learning to use a new device? How has this changed during your adult life?

I) What do you think about changing an old device for a new one? What would be important for you to do this?

j) What would you change of the devices we have discussed so far?

k) What do you think these devices help you to do in your everyday life?

a) Is there some device that you find easy to use? What does it make it easy?

b) Is there any device that is difficult for you to use? What does it make it difficult?

c) Is there someone you can ask for help to use a new device?

d) Is there any device that you started to use recently? (*probe: last year*) What made you start using it?

e) Is there any device that you have had to stop to use? What made you stop using it?

f) Is there a device that you would like to have at your home, but that you don't have at this point in time? What makes it useful for you? How did you learn about this?

a) How do you think technology can support older adults when they start to feel "memory problems" (probe: to solve problems, help with memory, take care of health)

b) How do you think technology can help you to feel good? (probe: to make better decisions, to feel connected, to learn more, to live at home)

c) How do you think technology can make you feel bad? (probe: to feel isolation, to feel confusion, to feel incapable)

d) What technologies do you think will be useful to you in the future?

e) What technologies do you think will stop to be useful for you in the future?

f) What would you say to an older adult with memory problems that wants to learn how to use a new device?

a) Is there something else you would like to add to our conversation?

b) What did you think about this interview?

## 9. APPENDIX II: Information sheet (Spanish)

**Título de la investigación:** La capacidad de vivir en el hogar usando tecnología cotidiana: experiencias de personas mayores con deterioro cognitivo leve en Barcelona.

**Contacto principal:** Samuel Briones ([s.briones@student.rug.nl](mailto:s.briones@student.rug.nl), Tlf móvil: +34 6 426 740 26), estudiante de maestría en Population Studies, Faculty of Spatial Sciences, University of Gronigen, Países Bajos.

**Supervisora académica:** Louise Meijering, PhD. ([l.b.meijering@rug.nl](mailto:l.b.meijering@rug.nl)), Faculty of Spatial Sciences, University of Groningen, Países Bajos.

**Proveedor de apoyo:** Consejo Nacional de Investigación Científica y Tecnológica de Chile (CONICYT) a través del programa “Becas Chile – Magíster en el extranjero”.

### Antecedentes

Esta investigación de tesis de Maestría busca entender cómo el uso de tecnologías puede ayudar a las personas mayores con deterioro cognitivo (leve) a vivir en su propio hogar. La tecnología, en su sentido más amplio, forma parte importante de la vida cotidiana de las personas mayores. Artefactos electrónicos y mecánicos tales como móviles, ordenadores o andadores pueden encontrarse en la mayoría de los hogares donde habitan las personas mayores con algún grado de discapacidad. A través de ellos, las personas mayores pueden autogestionar su vida cotidiana y obtener oportunidades de conectarse con su entorno social. Sin embargo, la forma en que las personas mayores usan y perciben la tecnología puede cambiar al sufrir algún tipo de deterioro cognitivo. Para estas personas puede ser difícil adaptarse a nuevas tecnologías o estas pueden también encontrar nuevos usos para la tecnología que les permita hacer frente al deterioro cognitivo. Para poder mejorar la calidad y relevancia de las soluciones tecnológicas ofrecidas a las personas mayores con deterioro cognitivo es importante conocer su perspectiva sobre la tecnología. Esta investigación indagará en cómo las personas mayores con deterioro cognitivo valoran la tecnología presente en sus hogares y cómo esperan recibir apoyo a través de la tecnología en el futuro.

### ¿Quién puede participar en esta investigación?

Cualquier persona mayor (de más de 65 años) residente en el Área Metropolitana de Barcelona, que viva en su hogar (cohabitando o no) y que haya sido diagnosticada con algún tipo de deterioro cognitivo en su fase inicial o que haya participado en un taller de memoria

en los últimos 12 meses. Los participantes deberán sentirse motivados a conversar sobre cómo usan la tecnología presente en su vida cotidiana (tales como teléfonos inteligentes, ordenadores, andadores, alarmas, etc.). Todos los participantes deben ser capaces de consentir su participación de forma autónoma. Las personas mayores podrán ser acompañados por alguien de confianza en todo momento durante su participación en la investigación, si así lo requieren. Ningún tipo de conocimiento previo es necesario para participar.

### **¿Cómo se puede participar en esta investigación?**

Se pedirá a las personas interesadas que participen de una entrevista en castellano (idioma nativo del estudiante investigador) acerca de sus vidas cotidianas y cómo usan y evalúan los diferentes dispositivos tecnológicos presentes en su hogar. Se espera que la conversación dure aproximadamente una hora y media. La entrevista será llevada a cabo en el lugar de preferencia del participante, preferentemente en su hogar y será grabada digitalmente para su posterior análisis. El investigador estará realizando las entrevistas en la ciudad de Barcelona entre los meses de septiembre y noviembre de 2018. Antes de iniciar la entrevista, los participantes recibirán información acerca de la investigación de manera oral y por escrito por parte del estudiante investigador. También se les pedirá que firmen un documento consentimiento informado para participar de la investigación.

Los participantes también tendrán la posibilidad de ser acompañados por una persona de confianza durante la conversación, si así lo desean. No hay costo alguno asociado a la participación en esta investigación. Los participantes podrán retirarse del estudio en cualquier momento antes de la publicación de los resultados finales.

### **¿Cómo se usarán los datos producidos en esta investigación?**

Los datos producidos serán usados en publicaciones y presentaciones científicas (tesis y papers, por ejemplo). Los archivos de datos serán almacenados y protegidos con una contraseña en la Universidad de Groningen. Sólo el estudiante investigador y su supervisora tendrán acceso a los archivos y datos de contacto de los participantes. En publicaciones y presentaciones, los datos serán presentados de una forma que no permita la identificación de los participantes. Los participantes tendrán la posibilidad de indicar que desean recibir un

resumen de los resultados de la investigación luego de que el análisis de los datos haya finalizado.

**Si usted o vuestra organización conoce de alguna persona que cumpla con los requisitos y esté interesada en participar, por favor refiéralas a Samuel Briones, estudiante investigador de la Universidad de Groningen, Países Bajos.**

**¡Muchas gracias!**

**Samuel Briones**

**[s.briones@student.rug.nl](mailto:s.briones@student.rug.nl)**

**Tlf móvil: +34 6 426 740 26**

## 10. APPENDIX III: Consent form (English)

### Informed Consent Form

The undersigned hereby declares that he / she is participating in the study: The capability to live at home using Assistive Technology: experiences of older adults with mild cognitive impairment in Barcelona. The most important aspects of the research are mentioned below:

- This study aims to analyze how older adults with mild cognitive impairment value technology at home and how they expect to receive support from technology in the future.
- You are invited to participate in a face to face interview of approximately one and a half hours of duration with Samuel Briones, a student researcher at the MSc. Population Studies, University of Groningen.
- This interview will take place in a location defined by the undersigned participant and he or she can be accompanied by a person of his or her choice.
- The conversation will be digitally recorded and verbatim transcribed by the student researcher for further analysis.
- The interview transcriptions will only be accessible to the student researcher and his academic supervisor Dr Louise Meijering, Assistant Professor at the Faculty of Spatial Sciences, University of Groningen.
- All the data produced in this study and your personal contact details will be stored in the University of Groningen's servers protected by a password known only by the student researcher and his academic supervisor.
- If you want a break, during the interview, you can indicate this, and this will always be made possible.
- You can ask the student researcher any time to stop your participation in the study, for whatever reason and without any negative consequences for you.
- The information you give us will be used for the development of a scientific article to be published in English and presentations in Conferences.

- In all these publications the research team will come up with a fictive name (pseudonym) for you and the people and places you mention in the conversation. This means that the data we present, can never be traced back to you.
- You can request to receive a summary of the findings of this study after the analysis process of the produced data is finished in November 2018.
- If you agree with this informed consent document, you may sign the form.

I am sufficiently informed about the conditions and consequences of the study and declare that I want to participate in this study:

Date:

Place:

Name of participant:

Signature:

Name researcher: Samuel Briones Barrales

E-mail: [s.briones@student.rug.nl](mailto:s.briones@student.rug.nl),

Mobile phone: +34 6 42 67 40 26

Signature:

I want to receive a summary of the main findings of this research once the analysis process is finished.

One copy of this document signed by the student researcher will be handed to each participant for his or her personal archive.

## 11. APPENDIX V: Codebook

### 11.1. Values associated with ET (deductive category)

Inductive code	Comment
Enables mobility	References to how technology enables the movement of participants inside and outside the home
Enables me to keep in touch with family and friends	References to the use of ET as a way of keeping in touch with significant others
Enables housekeeping	References to ET as enabler of housekeeping tasks
Enables access preferred content	References to how ET allows older adults to access certain contents and sources of information, according to their preferences.
Enables management of everyday life	References to ET as a way of managing everyday activities in the home, such as cooking, housekeeping, bricolage, gardening, entertain oneself, to rest, having appointments, etc.
Enables engagement in leisure activities	References to ET as a way of enabling the older adult to engage in leisure and social activities.
Enables safety	References to using digital payment instead of cash for fear of getting robbed.
Enables to remember things	References to the use of ET as mnemonics in order to remember things.
Enables sense of usefulness	References to the use of ET by participants that let them support somebody else in the household or to maintain a sense of "usefulness".
Enables communication with others	References to how ET can enable communication with other people.
Enables personal hygiene and appearance	Reference to the use of ET to manage personal appearance in daily life.
ET as deteriorating factor	Views about the use of ET and its causal effect of deteriorating cognitive abilities.

Enables me to "escape"	References to how ET can be used to escape problems or difficulties faced when having cognitive impairment
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## 11.2. Valued functionings (deductive category)

Inductive code	Comment
To engage with ICT	References to choices made to engage with ICT devices
To learn new things	References to choices made to engage in the learning of new things using ET
To simplify use of ET	References to choices made to simplify how the participants use ET, with or without help from others.
To engage in social activities	References to choices made to engage in social activities through the use of ET
To prevent/control cognitive decline	References to actions undertaken by participants to find a solution to memory problems
To update ET	References to the choice to update ET devices or not
To use ET in my own terms	References to the use of ET under self-specified conditions and functionings
To limit myself to what I can do	References to adaptations made regarding the use of ET according to perceived capacities
To play cognitive stimulation games	References to the choice of playing cognitive stimulation games
To cook for myself	References to the use of ET devices for cooking
To write things down	References to the use of ET devices to write things in order to remember them later
To learn how to use ICT	References to the choice of engaging in learning activities to use ICT devices
Not to overwhelm caregivers	References to actions in order to save work to caregivers

To solve domestic problems	References to actions executed using ET to solve domestic problems
Manage social contacts	References to use of ET devices to manage social contacts
To condensate ET usage	References to the choice of using only one device, usually the smartphone, that offers multiple tasks.
To not use ET	References to the choice of not using ET in certain situations
To have control over ET	When the participants take actions that allow them to exert control over how ET works and adapt it to their needs

### 11.3. Conversion factors (deductive category)

Availability of someone to ask for help	References to the presence of others that are available to explain/help the participants with problems associated with the use of ET
Having memory problems	References to how having memory problems difficult aspects of daily life, especially when engaging with ET
Being an older person	References to age as a barrier for engagement with ET
Attitudes towards learning	References to having a positive attitude and interest in learning new things, among them, how to use ET
Physical impairments	References to how physical impairments can be a barrier to engage with ET in daily life
Importance of practice	References to the importance of practice to overcome difficulties when engaging with ET
Role of family and friends	References to the role of family and friends as support when engaging with ET or to remember things
Familiarity of et	References to having previous knowledge of certain device as a facilitator for ET acquisition
Not knowing how to take advantage of et	References to the feeling of not being able to take full advantage of ET devices due to a lack of knowledge on how it works.

Simplicity of use of device	References to the advantages of having ET devices that are simple to use
Feeling overwhelmed by everyday technology	References to difficulties encountered when engaging with ET. These difficulties could be caused by lack of understanding or complexity of devices.
Unfamiliarity with technology	References to not having sufficient knowledge about certain devices, thus impacting negatively in the acquisition of ET.
Other's negative attitudes	References to how other's negatives attitudes towards cognitive impairment (misunderstandings, lack of patience, stigma) difficult engagement with ET in participants.
Trust in the technology provider	Reference to the role of a trusted ET provider (shopkeeper, salesperson) when acquiring new ET devices
Accessibility of instruction manual	References to using an instructions manual in order to know how to use a device or to solve problems related to it.
Caregivers role in management of daily life	References to the role of caregivers in the daily routines and management of daily life of participants
Influence of younger generations	References to the influence of younger generations in the acquisition and use of ET devices
Being part of a community centre	References to activities and ideas about being part of a community centre for older adults
Being able to understand the device	References on how participants "understand" how the devices work and use them accordingly; modifying or repairing aspects of the device.