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EXPLORING THE POTENTIALS OF VOICE-BASED CONVERSATIONAL AGENTS FOR THE ELDERLY: BEYOND A PRAGMATIC PERSPECTIVE

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

HİLAL ŞAHİN

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FOR
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IN
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ABSTRACT

EXPLORING THE POTENTIALS OF VOICE-BASED CONVERSATIONAL AGENTS FOR THE ELDERLY: BEYOND A PRAGMATIC PERSPECTIVE

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January 2023, 177 pages

Speech, the fundamental basis of human communication, is now enabling interaction between humans and machines. Correspondingly, the acceptance of Voice-based Conversational Agents (VCAs) by different age groups is remarkably rising. The aging population and events like COVID-19 have led to increased attention on elderly users in academic research, which focuses mostly on their declining mental and physical abilities. The aim of this thesis is to examine the impact of values, hedonic aspects, and routines of the elderly people on their perceptions of VCAs. To go beyond a problem-driven approach and examine the possibilities of VCAs for elderly users, this thesis is composed of a systematic literature review and an empirical study. The systematic literature review was conducted through 6 databases to find the hedonic aspects in the interaction between elderly and VCAs in the available literature. The empirical study used semi-structured interviews with 13 participants (9 elderly and 4 caregivers) to focus on the daily life experiences and routines of the elderly and to identify areas that could provide positive user experiences and values. The data was analyzed using the main components of Self-Determination Theory. The relationship between VCA features and hedonic aspects

was scrutinized to find potential areas for meaningful interactions between the elderly and VCAs. The main outcome of this thesis is that design decisions regarding VCAs should empower the elderly by protecting the areas where they feel autonomous and competent, while at the same time increasing their relatedness.

Keywords: Elderly, Voice-based Conversational Agents, Meaningful Interaction, User Experience

ÖZ

YAŞLILAR İÇİN SES TABANLI SOHBET ARACILARININ POTANSİYELLERİNİ KEŞFETME: PRAGMATİK BİR YAKLAŞIMIN ÖTESİ

Şahin, Hilal
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Ocak 2023, 177 sayfa

İnsan iletişiminin temel unsuru olan konuşma, artık insanlar ve makineler arasındaki etkileşimi mümkün kılmaktadır. Buna paralel olarak, farklı yaş grupları tarafından Ses Tabanlı Sohbet Aracılarının (Voice-based Conversational Agents - VCA) kabulü de kayda değer bir artış göstermektedir. Yaşlanan nüfus ve COVID-19 gibi küresel olaylar, çoğunlukla yaşlı kullanıcıların azalan zihinsel ve fiziksel yeteneklerine odaklanan akademik araştırmalarda bu yaş grubuna olan ilginin artmasına neden olmuştur. Bu tezin amacı, yaşlıların sahip oldukları değerlerin, hedonik yönlerin ve rutinlerin Ses Tabanlı Sohbet Aracılarına yönelik algıları üzerindeki etkisini incelemektir. Bu tez, problem odaklı bir yaklaşımın ötesine geçmek ve Ses Tabanlı Sohbet Aracılarının yaşlı kullanıcılara yönelik olanaklarını incelemek amacıyla, sistematik bir literatür taraması ve ampirik bir çalışmadan oluşmaktadır. Sistematik literatür taraması 6 veri tabanı aracılığıyla gerçekleştirilmiş ve tarama kapsamında yaşlılar ve Ses Tabanlı Sohbet Aracıları arasındaki etkileşime ilişkin mevcut literatürde bahsedilen hedonik yönler ortaya çıkarılmıştır. Ampirik çalışmada, yaşlıların günlük yaşam deneyimlerine ve rutinlerine odaklanmak ve olumlu kullanıcı deneyimleri ve değerleri sağlayabilecek alanları belirlemek için 13

katılımcı (9 yaşlı ve 4 bakıcı) ile yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Veriler, Öz Belirleme Teorisinin (Self-Determination Theory) ana bileşenleri kullanılarak analiz edilmiştir. Bu çıkarımlar doğrultusunda Ses Tabanlı Sohbet Aracılarınının hangi özelliğinin hangi hedonik yönleri etkilediğine bakılarak yaşlıların yaşamlarında anlamlı etkileşimler yaratabilecek potansiyel alanlar analiz edilmiştir. Bu tezin temel sonucu, Ses Tabanlı Sohbet Aracılarınına yönelik tasarım kararlarının yaşlıların kendilerini özerk ve yetkin hissettikleri alanları koruyarak onlara güç kazandırması, aynı zamanda da hayata dair ilişkiselliklerini artırması gerektiğidir.

Anahtar Kelimeler: Yaşlılar, Ses Tabanlı Sohbet Aracı, Anlamlı Etkileşim, Kullanıcı Deneyimi

To my beautiful family -the unflagging supporters- and to my beloved: *Cem*

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ABBREVIATIONS

AI : Artificial Intelligence

CA : Conversational Agent

CLI : Command Line Interface

GUI : Graphical User Interface

HCI : Human-Computer Interaction

IoT : Internet of Things

NUI : Natural User Interface

SDT : Self-Determination Theory

TV : Television

UX : Positive User Experience

VCA : Voice-based Conversational Agent

VUI : Voice User Interface

CHAPTER 1

INTRODUCTION

A UNESCO report written by West et al. (2019) confirms that there is a transition period from interactions through text to voice-based communication. The interest in Voice User Interfaces (VUIs) is on the rise in academia and the market (McTear, 2016). One reason for the growth of VUIs is the idea that speech is the most natural way for humans to communicate (Phan, 2017). Therefore, the VUI can be accepted as a turning point that has the potential to lead to a more enhanced natural communication in Human-Computer Interaction (HCI).

However, because elderly's familiarity with the new technologies is less compared to younger generations (Chen et al., 2021; Faverio, 2022) this transition has not been easy for them. Apart from this, the reasons such as the time it takes for the elderly to learn new technological products, the inability to do some tasks or to do them in a longer time due to memory problems, and the difficulty when they face an error also put distance between this age group and technology (Johnson & Finn, 2017). Added to that, the global population of the "oldest-old", defined as those aged 80 or over, is expected to triple in number from 2015 to 2050, reaching 434 million (WHO, 2015; WHO, 2022). This group is growing faster than the overall population of older people, which is defined as those aged 60 or over and is expected to increase by 56% from 2015 to 2030 and more than double by 2050, reaching around 2.1 billion (WHO, 2015; WHO, 2022). Turkey is also keeping pace with the global trend of increasing elderly population. In 2021, it was observed that 64.7% of the group fell within the 65-74 age range, while 27.3% were within the 75-84 range and 8.0% were 85 and above (TUIK, 2022).

Therefore, studies on the elderly have been on the rise recently in the field of HCI. For example, studies are being carried out in areas such as *health technologies* and *well-being* (Chen & Schulz, 2016; Ludwig et al., 2012; Sá et al., 2019; Ammar et al., 2021; Liu et al., 2019), *the use of mobile technologies by the elderly* (Iancu & Iancu, 2020; Nikou, 2015; Saraubon et al., 2018; Awan et al., 2021), *interactions with Internet of Things (IoT)* (Padikkapparambil et al., 2020; Saile & Navatha, 2022; Perez et al., 2022; Tun et al., 2021; Sokullu et al., 2020), *design of suitable interfaces for the elderly* (Dodd et al., 2017; Bong et al., 2018; Li & Luximon, 2020; Cheng & Sabran, 2021), *relationships with games* (Rienzo & Cubillos, 2020; Wiemeyer & Kliem, 2012; Kopeć et al., 2017; Cota et al., 2015; Boj et al., 2018) and *online shopping* (Kovalenko & Mazaheri, 2021; Kuoppamäki et al., 2017; Lian & Yen, 2014; Fernandes & Paschoarelli, 2014).

Among the studies exploring the relationship between the elderly and such emerging technologies, smart robots and their relations to the elderly are highly studied, although they are not easily distinguishable from Conversational Agents (CA), (as an example see the robot "ElliQ" in Figure 1.1 (Intution Robotics, 2022, Global Business Review Magazine, n.d.)).

Figure 1.1 The examples of assistive robot and conversational agents

Elderly-robot interaction is one of the relatively more studied areas in HCI (Bradwell, 2019; Sabelli et al., 2011; Salichs et al., 2020). In these studies, the intended use of the robots used/researched can be categorized under several headings: *Social and Mental Assistive Robots* (Mordoch et al., 2013; Kachouie et al., 2014; Abdi et al., 2018), *Pet Robots* (Ihamäki & Heljakka, 2021; Leng et al., 2019), *Service Robots* (Gonzalez-Aguirre et al., 2021; Chivarov et al., 2019), *Physical Activity/Exercise Robots* (Avioz-Sarig, 2021), and *Entertainment Robots* (Thünnesen, 2013; Correia et al., 2017; Geiger et al., 2014).

Kachouie et al. (2014) reported that social assistive robots support the well-being of the elderly and reduce the burden of caregivers. Another study indicated that the increasing use of social robots has the potential to help reduce the financial strain on healthcare systems and allow older adults to maintain their independence for longer periods of time (Salichs et al., 2020). Furthermore, robots in the shape of a pet through their companionship characteristics could lead to an increased social and emotional satisfaction (Ihamäki & Heljakka, 2021). Moreover, these robots are also used in the field of psychological therapy, PARO (baby seal robot), which provides pet therapy services for dementia patients in elderly care, is one of them (Hung et al., 2019). In a study with patients with dementia, statistics were presented that pet robots reduced depression and anxiety (Leng et al., 2019).

As to what service robots can do and how they can help the elderly, Gonzalez-Aguirre et al. (2021) stated that the service robots have the ability to do day-to-day necessities without help, to increase the social connections and reduce the isolation and loneliness as well as to be in assistance of the caregivers in their daily jobs. Chivaroz et al. (2019) similarly pointed out that due to its abilities to do tasks like medication reminding, meal serving, control of the appliances at home and health monitoring, these robots are used by elderly and disabled users. Robotic systems designed for entertainment can be particularly helpful for therapeutic purposes, particularly for elderly individuals, as they can help prevent loneliness (Geiger et al.,

2014). Robots also have the potential to prompt the elderly users to do physical activities with the help of several features such as feedback (Avioz-Sarig, 2021). It was found out that while expressing the expectation from an entertainment robot, participants stated that the robot should be able to demonstrate a diverse vocabulary through speech and have the ability to spontaneously react to orders, as well as move in a variable manner (Thünnesen, 2013).

Interaction between the CAs and the elderly is another area that recently saw an increase in interest. CAs are devices or softwares that can utilize different modalities like text, speech and video, or other sensory inputs in order to interact with users (Allouch et al., 2021). They use these inputs so that they can accomplish their goals such as giving advice or feedback in written or spoken form (Allouch et al., 2021). Many of them understand and interact with the users via the use of natural-language processing, and the accelerating improvement of machine learning makes the personalization of the CAs more possible (Allouch et al., 2021).

In their reviews regarding the use of CAs by the elderly, da Paixão Pinto et al. (2021) found out that CAs are usually embedded in four different environments; mobile apps, robots, desktop and web systems. When they examined the ways in which these CAs get inputs, they observed that speech dominates other modalities. Most of the studies in their review included systems with speech and the systems that accepted other modalities like texts, touch and click, and body movements also had speech functions (da Paixão Pinto et al., 2021).

The areas mentioned in the robot section also come to the fore in CAs in their relations with the elderly; what differs is the modalities that are used. Going beyond physical embodiment, CAs too are prominent in the areas of health and social/mental well-being, and companionship. First of these are CAs used in the field of health and social/mental well-being (for examples, see Fadhil, 2018; Clar et al., 2021; Bott et al., 2019; Eschweiler & Wanner, 2018). In a study, for example, the researcher discusses how a telemedicine chatbot could be used to support the elderly people that

are discharged from a hospital and would require medical information or who would need to talk to a doctor (Fadhil, 2018). Similarly, Miura et al. (2022) studied a chatbot that comes with a "rule-based virtual caregiver system" that asks its users one question daily to track their mental and physical health, which is used through mobile phones. In their research, Ryu et al. (2020) examine the agent named *Yeonheebot*, which is developed to help the elderly mentally and to help them cope with anxiety and depression.

Apart from these, CAs produced with a focus on companionship are other important examples (for examples, see Valtolina & Hu, 2021; Bechade et al., 2019; Ring et al., 2013; Hsiao et al., 2020; Simpson et al., 2020). To illustrate, Ring et al. (2013) examined the effects of the CAs on loneliness and its impact on the elderly's feel of social isolation, and found out that it is when the CA did not wait passively and took the initiative to start conversations that its effects are better seen. In another study focusing on isolation and the possible ways the CAs could help the elderly in that regard, Tsukada et al. (2015) scanned online blog posts that the elderly chose to read in order to find out topics and themes and the words related to those themes so that they could be included in the vocabulary of the CAs. Additionally, other studies delve into other topics and types of CAs for the use of elderly such as CAs as e-coaches for healthy living (El Kamali et al., 2018; Brinkschulte et al., 2021).

It is mentioned before that agents that converse with its users through voice constitute the majority of the CAs that the articles about CAs and the elderly studied (da Paixão Pinto et al., 2021). I believe this is because voice increases accessibility by making human interaction feel more natural and has the power to help involve seniors in the advances of technology, even if they are far from technology (Johnson et al., 2020; Dingler et al., 2021). That's why VCAs have potential for the elderly. In the market, there are many examples of this technology, such as Amazon's Alexa, Google Home and Apple's Siri for general use. Other than these general use devices

there are also devices that are designed for specific purposes like health assistants such as “Aiva” (Aivahealth.com, n.d).

An increase is observed in studies focusing on this interaction between the elderly and VCAs. However, the volume of these studies cannot keep up with the population’s aging pace (Sayago et al., 2019). In addition, the needs of the elderly are not sufficiently taken into account when designing voice assistants (Cuadra et al., 2022), and the focus of these studies is mostly on pragmatic dimensions such as usability and functionality with a problem-driven and/or medicalized approach (Leng et al., 2019; Gonzalez-Aguirre et al., 2021; Chivaroz et al., 2019, Ring et al. 2013; Fadhil, 2018). There are recent paradigms in the field of design that go beyond these pragmatic dimensions, focusing on well-being and positive values. In writing this thesis, I made use of these paradigms, as there observed a gap in consideration of the recent positive paradigms during elderly’s experiences with CAs. Briefly speaking, these paradigms focus on concepts such as meaning, motivation, emotions, hedonics or values. Going beyond pragmatic dimensions and taking affective responses and emotions into account is important because this approach could help create CAs that are good at being enjoyable and that make the elderly have feel-good moments so that they could have a more positive experience using these technologies (Yang et al., 2019).

Regarding this “beyond the pragmatic” approach, one initiative that comes to the forefront in design with the goal of increasing positive experiences is positive design. Its main objective is to boost happiness and long-term life satisfaction and this is the main goal of the design process rather than just a secondary result, where the purpose is established by its potential to affect “subjective well-being” (Desmet & Pohlmeyer, 2013, p.7).

Another important thing in elderly’s relationship with the CAs is the meanings attached to the experience of using these devices. To bring meaningful interactions to life, what is needed is to understand that a product, service or a system needs to

have qualities that lead to a connection between the product and its user. The designers, therefore, to create products that are more meaningful and valuable for the elderly, should design products intentionally so that they can be successful in offering people a chance to have more positive and fulfilling experiences (Hassenzahl et al., 2013).

By focusing on the fundamental psychological requirements outlined in Self-Determination Theory (SDT), the psychological effect and overall well-being of an individual in relation to a specific technology can be evaluated and optimized through empirical means (Peters et al., 2018). Therefore, this thesis utilized the SDT. In short, according to SDT, people's satisfaction with their psychological needs for *competence*, *relatedness*, and *autonomy* is affected by social and contextual factors (Ryan & Deci, 2017). SDT posits that people are inherently active and social and thrive in supportive environments, but may become vulnerable when basic needs are not met in controlling, rejecting, or negative environments (Ryan & Deci, 2017). It basically argues that when people feel they are competent in doing what they want to do; when people feel connected and belonging to a group; and when they are in control of their own actions, they thrive, otherwise they would feel frustrated.

In light of these, this thesis investigates the possible values that VCAs can create beyond a pragmatic perspective by focusing on the positive experiences of the elderly user group.

1.1 The Aim and Objectives of the Study

This research aims to investigate possibilities that can create positive user experiences and values between VCAs and the elderly to understand elderly users' attitudes towards VCAs beyond the pragmatic perspective. Also, the goal of the study is to offer insight into future research focusing on this challenging user group, the elderly, through design and research findings. At the end of this study, the actual

habits and daily routines of this user group were taken into account to identify the essential values and use cases that these voice technologies would bring to their lives.

1.2 Research Questions of the Study

In this study, different questions were asked to be answered through the literature and empirical study to find answers for the main research question. Accordingly, Group A questions below refer to the systematic literature review and Group B questions refer to the empirical study.

The main research question is:

How can VCAs provide meaning beyond the pragmatic perspective in elderly users' daily life?

The sub-questions that will provide answer for the main research question are:

A.1 Which hedonic aspects arise in elderly users' experiences with VCAs?

a) What are the VCA features that impact elderly users' VCA experiences?

A.2 What are the methodological considerations for investigating elderly's interaction with VCAs?

B. Which elderly values should be considered when designing VCA interactions?

a) What are the values that shape the elderly's perspective on life?
b) What values do the elderly attribute to technology?
c) Which scenarios/use cases can be considered in VCA to provide positive user experience?

1.3 Structure of the Thesis

This thesis consists of 5 chapters.

Chapter I provides background information explaining the importance of the research and providing a basis for problem definition. Then, the aims and objectives of the study are mentioned and the research questions are identified. At the end, the structure of the thesis is presented.

Chapter II presents a literature review, first, to provide a general background on the development of interfaces and then to present a brief introduction for concepts Positive User Experience and Meaningful Interaction as the paradigms that this study grounds on. The section also overviews Self-Determination Theory as the major framework utilized in this thesis to make sense of the elderly's perspective on life.

Chapter III, the first step of the methodology (Study I), presents a systematic literature review to identify the hedonic aspects of interactions with voice assistants in studies focusing on the experiences of elderly people. First, the methodology of the study is explained in detail. Then, the descriptive information of the study is presented in depth. At the end, the results of the study are given under two sections: positive and negative hedonic aspects.

Chapter IV, the second step of the methodology (Study II), describes the empirical study with elderly people and caregivers. After describing the methodology in detail, the results are presented under three headings (perspectives on life, technology and VCAs). Finally, the findings of the study and the potentials of VCAs for the elderly are discussed.

Chapter V summarizes the overall results of both studies, reviewing the research questions. The study concludes by presenting recommendations and limitations for future studies. Figure 1.2 below overviews how each chapter provides input to the main research question through questions answered.

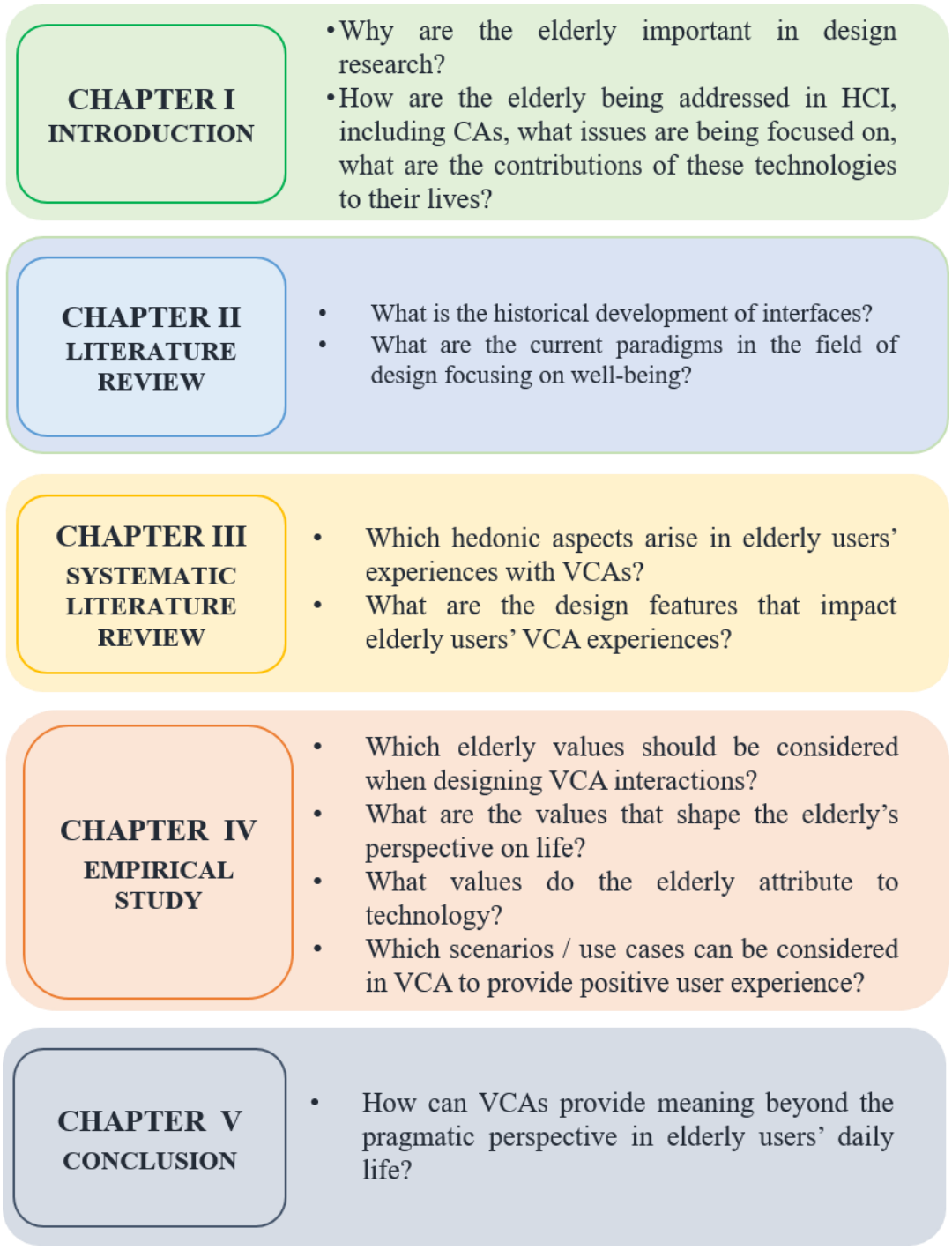

Figure 1.2 The structure of the thesis

CHAPTER 2

LITERATURE REVIEW

In this section, the related literature will be presented with 2 main sub-headings. These are: (1) The Evolution of Interaction Modalities, (2) Current Paradigms in Design Beyond a Pragmatic Perspective. After giving a brief history regarding the evolution of users' interactions with computers and related modalities in the first part, current paradigms in the design field that focus beyond pragmatic dimensions, which are Meaningful Interaction, Hedonics and Positive User Experience and Self-Determination Theory (SDT), will be explained.

2.1 The Evolution of Interaction Modalities

Human-Computer Interaction (HCI) re-shapes the interaction modalities between humans and computers, and this situation reflects on the evolution of the technology itself. The user interfaces that allow humans to interact with the computer have started to change over time. The technological improvements provide an opportunity for ever closer interaction between machines and users. The flow of interaction style evolves from abstract to direct through Command Line Interfaces (CLIs), Graphical User Interfaces (GUIs), and Natural User Interfaces (NUIs) (Figure 2.1) (Suarez Fernandez et al., 2016, p. 1014).

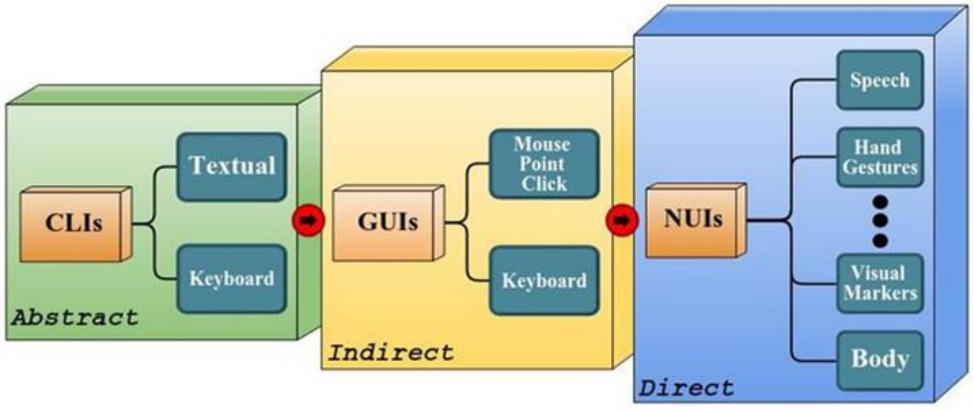

Figure 2.1 The evolution of user interfaces

However, before all of these progresses came into existence with the rise of the computers, we already had an interface for the interaction between humans and the computers, which included systems of teletypes and punch cards. As Stephenson (1999, p.5) correctly points it out, the underlying logic of these systems was prevalent until 1984. With teletype machines, the receiving unit transformed the electrical signals sent by the sending unit into typed characters or numbers, which were basically mere changes in current flow (Hallas, n.d.). CLI, at the beginning utilizing this power of the teletype machines and then the computers, showed itself with a blank screen and a prompt, where the interaction between human and the computer happened through a keyboard (Martinez, 2011). This has required a user that knows what s/he should do or in which manner s/he should "speak" with the computer in order to enter correct commands (Martinez, 2011).

What made GUIs special was the use of a mouse to do routine tasks like calling up files or starting programs with the help of windows, icons, menus or other visual interface tools, without having to write commands or to "code" in order to interact with the computer (Levy, 2022; Babich, 2020). The metaphors used were also helpful, in the sense that people could understand more easily which interface element means what through association with previously known objects (like folders,

albums or programs) (Marcus, 1998). So, with GUIs, users no longer had to be experts in order to interact with the computers, which paved the way for the mass commercialization of the computers, with Macintosh and Windows being the first examples. Going one step further, NUIs have started to provide ease of use thanks to natural ways of communication like speech, touch, hand and body gestures, or visual markers (Figure 2.2 (Quraishi, 2021)) (Suarez Fernandez et al., 2016).

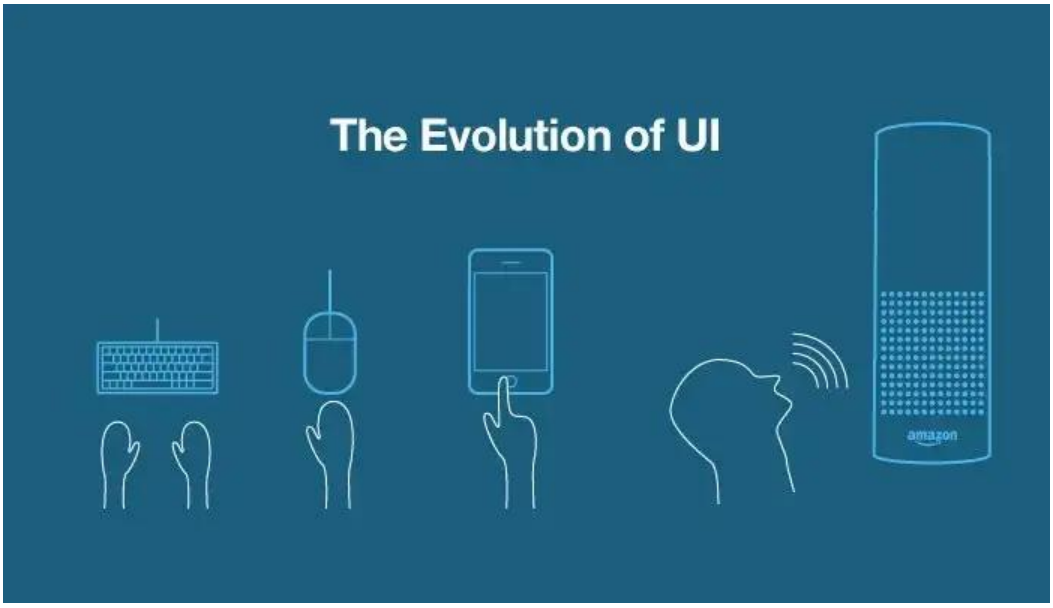

Figure 2.2 The evolution of UI

In addition to natural ways of communication styles, NUIs feed upon other similar daily experiences and interfaces and also give fluid interaction without interruption (Steinberg, 2012). Steinberg (2012) also advocates that being intuitive and fluid, NUIs provide an opportunity to include the user with little training, without knowing how to use the product. So, the system can be more adaptable and quickly understandable and usable. Furthermore, the most prominent advantage of the NUIs is utilizing the current developments in Natural Language Understanding (NLU),

which accelerates transformation into Conversational User Interfaces (CUIs) (Lauren & Watta, 2019).

CUI has been defined as allowing both actors (user and computer) to interact in conversation mutually, because there is a need for interfaces that can understand the user input and develop appropriate answers and solutions for issues in daily life (Zue & Glass, 2000). CUIs are used to define diverse systems that enable the user to converse with the product or machine like *bot*, *chatbot*, *virtual personal assistant*, *digital assistant*, *conversational agent*, *conversational bot*, and *messaging app* (McTear, 2016, p. 39). These systems can be differentiated among themelves in three ways: (1) backend connections (database, task/control modules), (2) channels they use (such as Facebook Messenger, Skype, Amazon for chatbots), and (3) interaction styles such as text, voice and avatar (Janarthanam, 2017, p. 34). Janarthanam (2017) emphasized that one aspect that unites these systems is their capacity to communicate in a natural language-based conversational manner. Unlike the preset of instructions and drop-down menu options, supporting spontaneous, turn-by-turn conversation, and even tracking the conversation with follow-ups through natural language ensures the "conversational" side of these products (McTear, 2016).

Recently, the awareness of conversational interfaces has begun to expand its network between users and manufacturers through chatbots and voice-based assistants (Langevin et al., 2021). The first examples of conversational interaction are accepted as chatbots that allow text-based communication (Bors et al. 2020; Laranjo et al., 2018). In the third quarter of the 20th century, after the chatbot named ELIZA, which provides text-based psychotherapy service, examples that enable human-computer interaction based on a question-and-answer dialog have continued to increase. Conversational Agents (CAs) have revived the communication between two actors, human and computer, with written or voice interfaces, with the improvements in Artificial Intelligence (AI) and NLU (Bors et al. 2020; Laranjo et al., 2018). When it comes to naturality, voice is one of the most prominent forms of interaction thanks

to resembling human-like conversation, increasing attention in the literature and market (Song et al., 2022).

Voice-based systems have started to be integrated into divergent technological devices from mobile phones, tablets to conversational agents designed to be stand-alone (Humphry & Chesher, 2020). In the last decade, parallel to this, the integration of VCAs into our daily lives has been accelerating with the AI-supported products of the globally known technology firms on the market, such as Amazon, Apple, and Google's products Alexa, Siri, and Google Assistant (Han & Yang, 2018). A report that was funded by UNESCO (2019) confirms that we transition to voice-based communication rather than getting interaction through text. Therefore, the CUIs can be accepted as a turning point that leads to more enhanced naturalistic communication through speech in the future. Nevertheless, although CUIs may provide ease of use, in terms of being *intuitive, flexible, customizable, and fluid,* for all user groups as interactions move from abstract to direct, the ease of use they provide for some users may be more prominent (Steinberg, 2012). Especially for the elderly, it seems to provide convenience or improved accessibility (Hsiao et al., 2017). However, the interaction of the elderly with technologies also faces other challenges. For instance, most of them experience a decrease in physical abilities, or they have difficulty in constructing proper sentences for the device (Kim, 2021; Pradhan et al., 2020) or they use sentences that are longer and complex (Xing et al., 2022). Also, abilities of the technological product itself is limited, i.e. not understanding well, so the interaction of the elderly with technologies is a special subject of study in itself. In order to understand what positive dimensions and features to focus on beyond the problems of usability, I will present current paradigms in the field of design that focus on this.

2.2 Current Paradigms in Design Beyond a Pragmatic Perspective

Grounding on the role of companionship by reducing loneliness, increasing social connectedness, the role of therapist by reducing feelings of anxiety/depression, and the role of assistant by serving meal, tracking medication mentioned in the previous section (see Chapter 1), how elderly attribute values and meanings to technology should be also crucial in the field of design. In order to provide a background, information on the following areas will be given: Meaningful Interaction; Hedonics, Emotions and Positive User Experience (UX); and Self-Determination Theory (SDT). In the first one, how meaning started to be a part of the design process, going beyond the obsession with usability or functionality, will be underlined. In the second one, how hedonic and emotional aspects are one of the primary tenets of a positive UX, where the affects became further accentuated, will be shown. In the last one, the SDT will be examined, which deals with three major psychological needs in relation to human motivation, personality, and optimal functioning. These are found as important factors for increasing users' motivation during their interactions with products/services/systems and also enhancing their well-being (Ryan & Deci, 2017). Thus, SDT highly relates to users' meaning making processes and positive user experiences as it theorizes that both intrinsic and extrinsic motivation, encompassing the effects of social and cultural settings have the power to shape how people interact with their environment, including the technological devices.

2.2.1 Meaningful Interaction

Meaningful interaction in design refers to the way that users can engage and interact with a product or service in a way that is meaningful to them. Krippendorff (2005) in his famous book "*The Semantic Turn: A New Foundation for Design"* underlined that there needs to be a change in understanding as to what design means in terms of the fact that design does not have to be only about designing products for the mass

production and consumption. As de Medeiros (2014) argues, designers today need to and have started to look behind the pragmatics of a product, such as functionality or usability, in order to see what a product or service could bring emotionally or semantically, and to be able to reach users more meaningfully. A product not only needs to do certain tasks; it also has to in some sense "connect" to its user.

Although it is often emphasized in the literature that meaningful interaction does not have an agreed definition, and it is mostly about emotions, and it aims to look beyond usability, it could be said that it can analyze all kinds of interactions that are meaningful to and "establish a bond" with people, communities or societies.

Recently, studies that emphasize the importance of working towards meaningful interaction in terms of both general technologies/products and voice assistants are starting to be introduced. For example, Mekler and Hornbæk (2019, p. 5) created a framework that "outlines five distinct senses of the experience of meaning: connectedness *("always connected to the self and the world")*, purpose *("sense of core goals, aims, and directions")*, coherence *("comprehensibility and making sense of one's experiences")*, resonance *("clicking with something or feeling it is right")*, and significance *("enduring value and importance").*

In order to enable meaningful experiences with the help of specific interaction modalities, speech, being one of the prominent natural ways of communication (Kamble, 2016), could foster a more meaningful medium for interaction with technological devices thanks to its characteristics like its superiority in conveying emotions (Akçay & Oğuz, 2020). However, devices that use this human ability are much newer compared to other modalities, even compared to relatively new devices that are utilizing the sense of touch; and therefore, it poses other difficulties such as relatively high level of latency or the need for a toleration of user interruption (Aylett et al., 2014). Yet, voice-based technologies are important in the sense that "technology has become part of our social fabric and as such this technology needs to be able to engender playfulness, and enrich our sense of experience" and

“applications [and products] which could perform a key role in mediating technology for social good require a means of interacting with users in much more complex social and cultural situations” (Aylett et al., 2014, p. 756). Focusing on CAs, Yang and Aurisicchio (2021, p.9) created ten guidelines based on their interview findings that examine how motivation to use a CA can be strengthened or weakened. These guidelines include things like *providing a personalized overview of the capabilities of CA* [Conversational Agents], *speaking politely, and learning about usage habits over time from past interactions* (Yang & Aurisicchio, 2021, p.9).

2.2.2 Hedonics, Emotions, and Positive User Experience

Although this is quite related to “meaning”, this section deserves its own place because it is a research area in HCI in itself. In a similar vein, the designers or academicians should go further than dealing only with the efficiency or usability of a product or service in order to be able to grasp the totality of a user’s experiences with the said product or service. As Hassenzahl (2008, p.11) pointed out that technology is much more than fulfilling certain duties, it is also other things like “insight, pleasurable stimulation, social exchange” that constitute our objective to use something and at the end what we end up with are “feelings and experiences”. He defines User Experience (UX) as something dependent on the moment, as an evaluation that we make during our interactions with a product or service; therefore, by UX, what he means is “the subjective side of product use,” feelings, not things like functionality or interaction (Hassenzahl, 2008, p.12). Agarwal and Meyer (2009) argue that it is because of the fact that usability is the easiest parameter to evaluate about the UX that most scholars overemphasize it; and therefore, they place less emphasis on emotions, which could also affect usability. Hassenzahl et al. (2021) even go further than that and propose that the hedonic not only complements the pragmatic, it is even more important than the usability of a product and service in users’ decision to use something: People use products and services because they

enjoy it, or it means to them, the usability only follows it. A design approach offering people more chances to participate in positive and fulfilling experiences that have been intentionally crafted can create happiness (Hassenzahl et al., 2013). It should also be emphasized that hedonic and pragmatic values cannot be separated from each other with a sharp line, and that the positive/negative feelings that may arise in terms of both may also affect each other.

Although studies that highlight the positive aspects of the users' interactions with products came more into sight at the onset of the 21st century, very recently an initiative concentrating on well-being has blossomed. So, there is an initiative called *positive design*, whose primary goal is to enhance happiness and long-term satisfaction with life, and this is the primary goal of the design process, rather than just an incidental outcome, where the purpose is determined by its potential impact of "subjective well-being" (Desmet & Pohlmeyer, 2013, p.7). The three elements that contribute to positive design are (1) designing for *"pleasure"* (*"momentary pleasures", "the presence of positive affect and the absence of negative affect"*), (2) designing for *"personal significance* (*"one's personal ─long- or short-term─ goals and aspirations" instead of "here and now"*), and (3) designing for *"virtue"* (the idea of good and bad behavior *"independent of what we might enjoy or strive for"*) (Desmet & Pohlmeyer, 2013, pp.7-9). Individually, these factors enhance subjective well-being, and when combined, they create an optimal "sweet spot" for positive design (Desmet & Pohlmeyer, 2013, pp.7). Similarly, another study proposed that technology design should aim for the holistic improvement of well-being, encompassing physical, psychological, and social aspects, rather than just focusing on values individually. The ultimate objective of technology development should be to enhance well-being in all its forms (Kafaee et al., 2021).

In short,

> on a hedonist conception, design for well-being is design for pleasurable experiences or for the prevention or lessening of negative ones. By this criterion, the focus will be on designing artifacts that cause pleasant sensations, enable users to undertake activities that are pleasurable, allow users to avoid unpleasant activities, and prevent or reduce mental and physical pain and discomfort. (Brey, 2015, p. 374)

On the other hand, regarding voice technologies, in a review of 68 studies on the use of VUIs and speech in HCI, Clark et al. (2018) found that the studies mostly focused not on well-being but on usability or theory-related topics, with a clear lack of interest in design-related work focusing on hedonic aspects.

2.2.3 Self-Determination Theory

As a mature and empirically-validated approach, Self-Determination Theory (SDT) could be used in designing for well-being (Peters et al., 2018). SDT is a theory of human behavior and personality development that focuses on how social and contextual factors influence the satisfaction of basic psychological needs for *competence*, *relatedness*, and *autonomy* (Ryan & Deci, 2017). According to SDT, human nature is designed to be active and social, and when given a supportive environment, will thrive and have integrity, but can also become vulnerable to being "derailed or fragmented" when basic needs are not met in environments that are characterized by control, rejection, criticism, or negativity. The latter environments would lead to behaviors that involve a focus on the self, defensiveness, a lack of motivation, aggression, and a lack of concern for social norms or rules, which are typically indicative of social contexts that are thwarting fundamental psychological needs (Ryan & Deci, 2017). The expression of human nature is dependent on the conditions of support or thwarting and satisfaction or frustration of basic needs, and the relationship between human beings and their social contexts is dialectical, with

the potential to either support or thwart active, integrative tendencies (Ryan & Deci, 2017).

The founders of the theory propose that humans have three basic psychological needs: *competence, relatedness,* and *autonomy*. By the need for competence, what is meant is "our basic need to feel effectance and mastery" (Ryan & Deci, 2017, p.11). Human mind requires to feel that a person is able to accomplish duties by himself/herself and manifests itself in "curiosity, manipulation, and a wide range of epistemic motives"; and competence can be hindered in situations where the challenges are too difficult, there is a prevalence of criticism or disapproval, or if a person's confidence in their abilities is damaged by external factors such as criticism and being compared to others (Ryan & Deci, 2017, p.11).

Relatedness is about our social needs; it is felt at most when we feel that others are caring for us and when we feel that we belong to a group, and it also involves feeling connected and significant within social groups beyond just close relationships. Participating in activities that benefit the group, like acts of kindness, can further increase feelings of relatedness and belonging (Ryan & Deci, 2017, p.11).

Autonomy is the feeling of having control over one's own actions and decisions, and experiencing them as being self-directed rather than imposed by external pressures. It is a sense of agency and the belief that one's actions reflect one's true identity (Martela & Riekki, 2018). It is when we feel that we are not under the control of someone else or that it is because others pushed us to do something that we are not doing it (Sheldon & Filak, 2008). In this regard, the founders of the theory make a distinction between two types of motivation, intrinsic and extrinsic: The former refers to the internal drive to engage in an activity for one's own enjoyment or personal fulfillment, rather than for the sake of external rewards or incentives; and the latter refers to the influence of external factors on an individual's decision to engage in a particular activity, which is often driven by a desire to achieve specific

outcomes or rewards that are separate from the activity itself (Ryan & Deci, 2000) (see Figure 2.3 (Legault, 2017)).

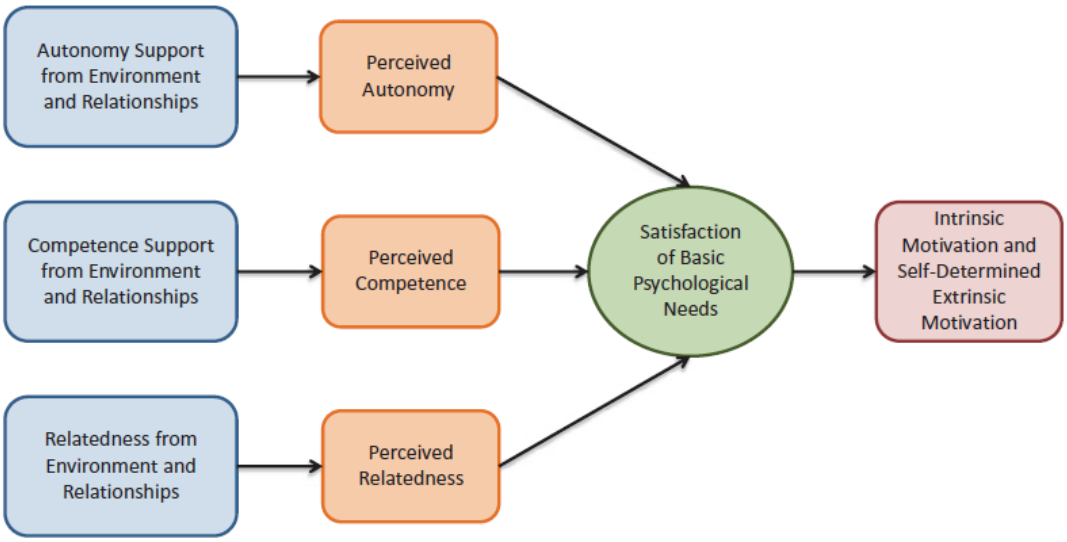

Figure 2.3 Self-Determination Theory

The SDT finds use for some time in many different fields, such as education (Reeve & Cheon, 2021), health (Ntoumanis et al., 2021; Gillison et al., 2021), well-being (Martela & Ryan, 2021; Martela & Sheldon, 2019) including HCI. Within the HCI, research areas like “games”, “health and wellbeing” or “virtual agents and human-AI interaction” are prominent among others (Ballou et al., 2022). In one such study by Hassenzahl et al. (2010) focusing on need fulfillment, it is found out that, essentially, if people had positive experiences with technology, it enhanced their connections with others, gave them new and exciting learning opportunities, and allowed them to feel competent. In another study, Zhang et al. (2022) conducted semi-structured interviews with 45 elderly participants to create basic principles that could be followed during the design process of mobile apps that are oriented towards the use of the elderly in aspects of autonomy, competence and relatedness. Design

of conversational agents is also studied through the lens of SDT. As I have mentioned before in the section "Meaningful Interaction" (see Section 2.2.1), Yang and Aurisicchio (2021) first conducted interviews and then with the help of the results of the interviews prepared guidelines to examine the extent to which VCA experiences either fulfill or hinder a user's needs for competence, autonomy, and relatedness. In brief, what they attained is that the VCA's efficiency and skills, as well as the user's awareness of these factors, can influence their sense of competence. On the other hand, the flexibility and adaptability of the dialogue as well as the user's agency over their data may have an impact on autonomy. Regarding perceptions of relatedness, it is found out that relatedness could be supported by VCAs in three ways: as a communication tool such as video calls, as a gateway to social channels and interaction with people and as a tool for activities like games with friends and families (Yang & Aurisicchio, 2021).

CHAPTER 3

STUDY I: SYSTEMATIC LITERATURE REVIEW ON ELDERLY USERS' VCA EXPERIENCES AND VALUES

A systematic literature review, sometimes called a research synthesis, is a type of review that aims to comprehensively and objectively summarize the results of multiple studies on a specific topic. It is similar to a literature review in that it summarizes knowledge from a body of research, but it is more focused on finding and including all relevant evidence and on presenting data rather than concepts or theory (Aromataris & Pearson, 2014).

There are several literature reviews that focus on the relationship between the elderly and the VCAs. For example, da Paixão Pinto et al. (2021), though not exclusively on VCAs, conducted a comprehensive literature review on CAs and the elderly, where they tried to find answers for questions of engagement strategies, the platforms that the CAs are embedded, which modalities are used, personalization options, and how and according to which criteria CAs are evaluated. In one literature review on the VCAs and the elderly, the researchers reviewed relevant studies published between the years 1970 and 2020 in the journal Human Factors or the Proceedings of the Human Factors and Ergonomics Society in Sage Publication database (Stigall & Caine, 2020). Even et al. (2022), on the other hand, made a scoping review in which they focused on the benefits and challenges of CAs in terms of healthy aging and more specifically for the elderly with intellectual disabilities. Arnold et al. (2022) as well conducted a comprehensive literature review on the use of VCAs by the elderly, whom they defined as people aged 50 or above, and their caregivers, and they focused on points like study types and methods, the type of voice assistance used, and usability/functionality/efficacy aspects. In a similar way, Jakob (2022) reviewed the literature on "Voice Controlled Devices" and their relationship with the elderly,

with a concentration on the learnability and usability and the barriers before the elderly's adoption of these devices.

This review differs from these studies in the sense that the aim and focus was to go beyond the aspects of usability, functionality and efficacy and to try to grasp the affective responses and values that the elderly attach to VCAs, and their emotions about them. This aspect of the interaction between the VCAs and the elderly seems to be overseen by the authors of these reviews, or it took up a limited space in their studies. In some studies, the role of the caregiver in this relationship was not taken into account (Stigall & Caine, 2020), or the focus was on the elderly people with intellectual disabilities (Even et al., 2022). I believe, with this literature review we will be better able to cover these aspects of the interaction between the VCAs and the elderly and also I think the methodological implications that I have put together will be helpful for future research.

Therefore, this research was conducted to explore factors beyond the pragmatic aspect of the elderly users' experiences and perspectives in their interaction with the VCAs. By facilitating existing studies that included both the elderly and other main actors in their lives, I aimed to review them systematically.

To provide meaningful interactions for the elderly, there is a need to look beyond a pragmatic perspective by including elderly users' affective responses, preferences, and expectations. In this regard, to consolidate knowledge and present an integrated resource through a systematic review and to provide a solid ground for my empirical study, I retrieved 780 articles from 6 databases, out of which 37 met the inclusion criteria.

To accomplish this I tried to answer following research questions:

A. 1. Which hedonic aspects arise in elderly users' experiences with VCAs?

a) What are the VCA features that impact elderly users' VCA experiences?

A. 2. What are the methodological considerations for investigating elderly's interaction with VCAs?

In this chapter, the methodology of the study will be shown in detail. Then the descriptive findings of the study with the methodological implications will be presented and finally the main outcomes of the study will be mentioned.

3.1 Method of the Study I

All methodology steps of the Study I will be discussed below by starting from the pre-data collection phase to the analysis of that collected data (see the Figure 3.1 below for an overview).

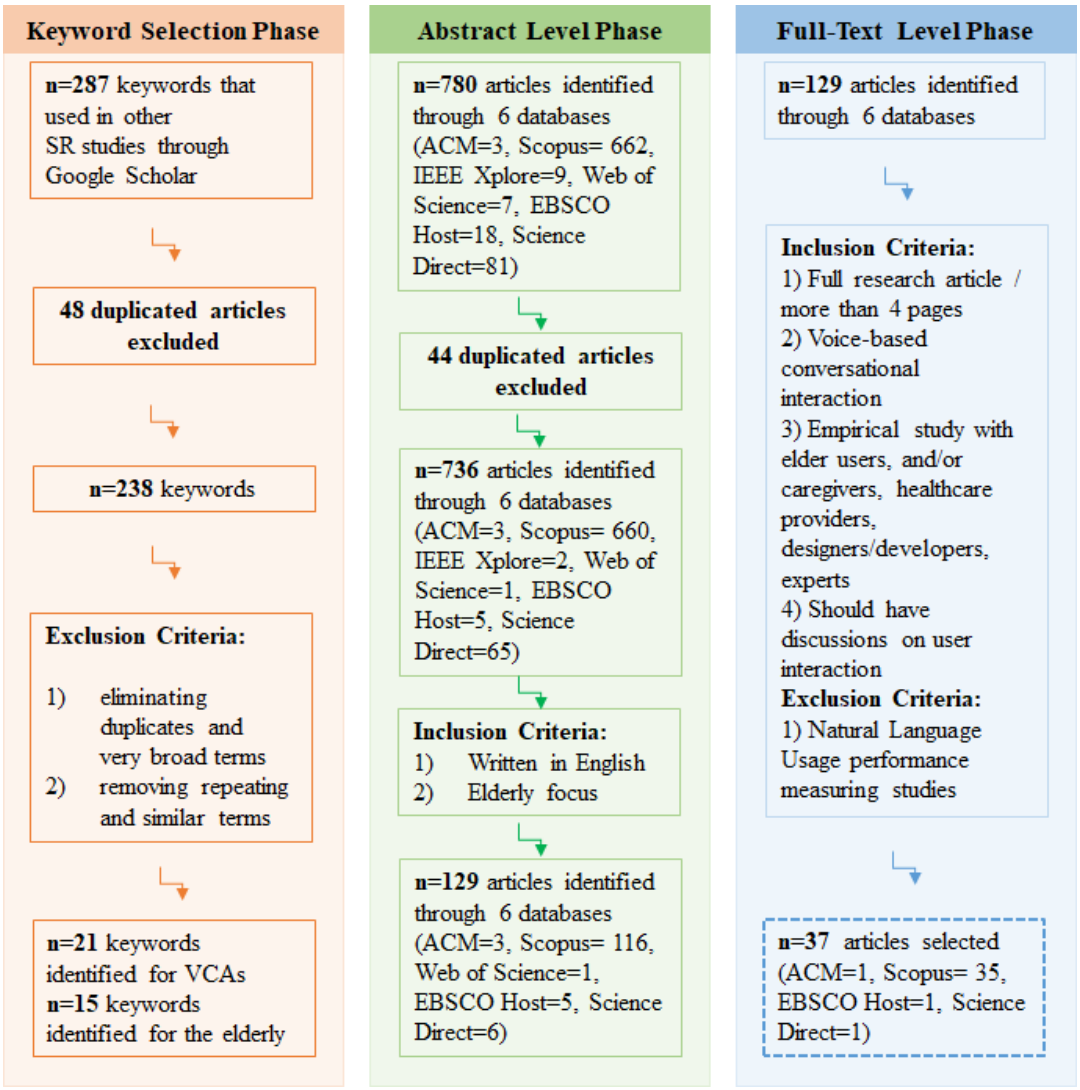

Figure 3.1 Data collection process

3.1.1 Keyword Selection Phase

Intelligent Virtual Agents, (Embodied) Conversational Agents, Digital Voice Assistants, Voice-based Assistants and similar terms are used to represent devices that interact with users through voice input or output (Stigall et al., 2019). Since there are numerous preferred terms for VCAs, a quick scan was needed to decide on search terms before starting the systematic review process. To decide which one to use, I decided to pool (see Appendix A) all the terms used in the studies and then select the most distinct ones to operationalize in the study. By initial desktop search through Google Scholar, fundamental keywords were combined in three main categories which are related to (1) VCAs, (2) Systematic Review, and (3) the elderly. First, all the keywords used in these systematic literature reviews were compiled and 287 keywords were reached. The total of 238 keywords were obtained when the repeated keywords were subtracted (Figure 3.1). Without putting any time frame limitations, systematic reviews were listed that show up on the first pages of Google Scholar in June 2021. I reached a total of 238 keywords describing the elderly and VCAs (Figure 3.1). Then, I came together with my thesis advisors and decided on 2 criteria to filter out the keywords to be used in the current systematic literature review on hedonic aspects in the interaction between elderly and VCAs. These were (1) eliminating duplicates and very broad terms which may include other technologies and paradigms that might skew the results beyond the current scope (like “agent”, “audio”, “interface”), (2) removing repeating and similar terms. At the end of this process, 21 keywords that define VCAs, and 15 keywords that define the elderly were chosen to be used in the actual systematic literature review (Figure 3.2).

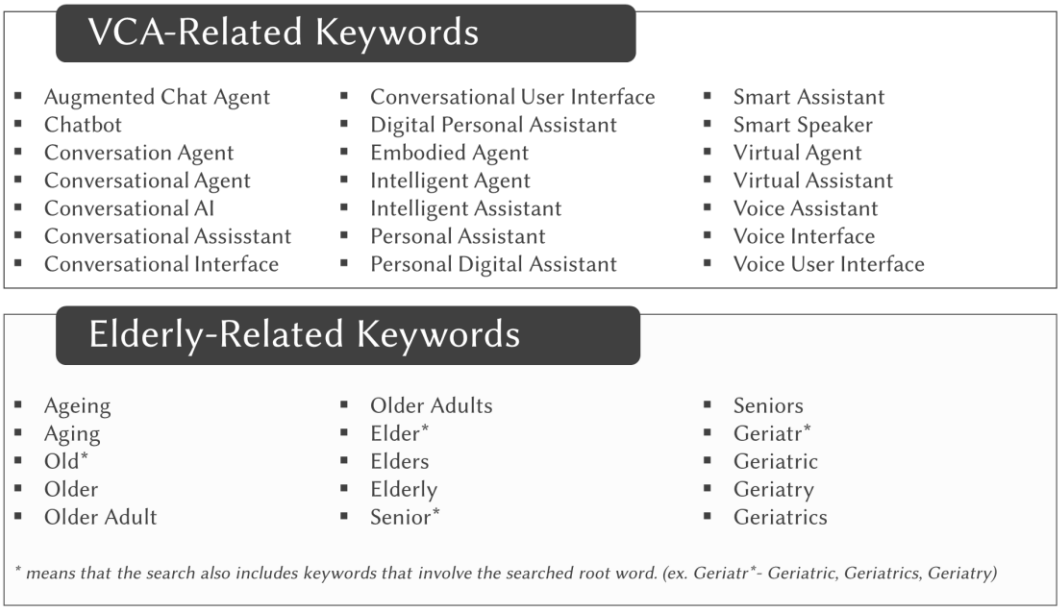

Figure 3.2 Selected keywords

3.1.2 Source Review Phase

After selecting keywords, 6 databases were agreed on with the advisors: ACM, Scopus, IEEE Xplore, Web of Science and EBSCO HOST and ScienceDirect. The ACM and IEEE Xplore databases have enabled me to find work in the fields of HCI and interaction design, and others have enabled me to include work on this topic that goes beyond these fields to cover other fields as well. In January 2022, the systematic literature review was completed over these 6 databases. Within all databases, reviews included the studies that have the aforementioned keywords in both the article titles and abstracts. Articles written in languages other than English and articles other than Research Article/Journal, such as posters, extended abstracts, short papers, work-in-progress, and so on, were excluded. Similar to the keyword selection, in order to be as comprehensive as possible regarding the time frame, time-related restrictions were not applied. This source review phase resulted in 780 articles, out of which 44 were identified as duplicates (Figure 3.1).

3.1.3 Elimination Phase

736 articles were listed to determine the eligibility criteria for the systematic literature review. During this elimination process (see Figure 3.1 above), in the abstract level selection, even studies that include other groups besides the elderly (younger adults, disabled persons, patients with cognitive impairments, etc.) were also included but care was taken to ensure that the main focus of these studies was on the elderly. In the second stage, full-text level selection, in addition to those who conduct empirical work with the elderly, studies that involve potential main actors (such as caregivers, healthcare providers, and designers) were also included in full-text search who are hand in glove with the elderly to ease their daily life practices because I believe that these actors could have insights into the lives of the elderly, which would help designing products that overlap with their wants and needs. Abstract and full-text level criteria that were jointly created together with thesis advisors can be seen (Figure 3.1). At the last stage, 37 studies were left that met the inclusion criteria in the publication pool of this systematic literature review.

3.1.4 Analysis

In the analysis part, the content analysis method was utilized, which involves analyzing the substance of messages in light of their intended meanings, contexts, and purposes (Prasad, 2008). In the beginning, I coded ten percent of the articles by using the software MAXQDA. Later, the obtained outputs and themes were shared with the two advisors of the thesis to reach a consensus on them. After a codebook was jointly agreed upon, all the remaining articles were coded by using the software MAXQDA, and related main themes were determined (Table 3.1). Furthermore, the process was completed by meeting with my thesis advisors periodically to review, discuss and resolve any ambiguities and conflicts.

In the next section, after presenting the descriptive findings from the study (user profiles in the studies; main topics of the studies, temporal framework and methodological decisions in the studies), then, the main findings on hedonic aspects will be presented.

Table 3.1 Obtained main themes

Motivations for use	Building companionship
	Showing tolerance towards functional errors
	Reducing feeling of loneliness
	Interaction through voice
	Support independent living
Motivations for not use	Ethical Concerns
	Financial Concerns
	Technical Concerns
	Privacy Issues
	Trustworthiness
Research Methodology	Personal Concerns
	Research Domain
	Preparation Process
	Research Methods
	Research Context
	Study Length
Recruitment Process	Participant Profile
	Inclusion / Exclusion Criteria
VCA Related Qualifications	VCA Brand
	VCA Type
	Used VCA Features
	Role of VCA
Limitations	User Related
	Product Related
	Methodological

3.2 Overview of VCA Research

In this section, descriptive information of the study will be presented under 6 sub-headings. These include information on (1) the user profile (2) the topic (3) the length (4) the method (5) the context and (6) the VCA terms and brands used. Then, implications about the methodologies used in the studies are presented to support the methodology decisions made in Study II and to guide further studies.

3.2.1 Descriptive Information Related to Studies

Before moving on to the sub-headings, a summarizing table with 7 sub-headings (User Profile, Topic, Method, Length, Context, Preferred VCA Terms and Brands) was prepared for the 37 articles included in the systematic literature review within the scope of Study I (the full list of references is available in Appendix F in numerical order according to the numeric order in the figure). Explanation will be made through these figures below (Figure 3.3).

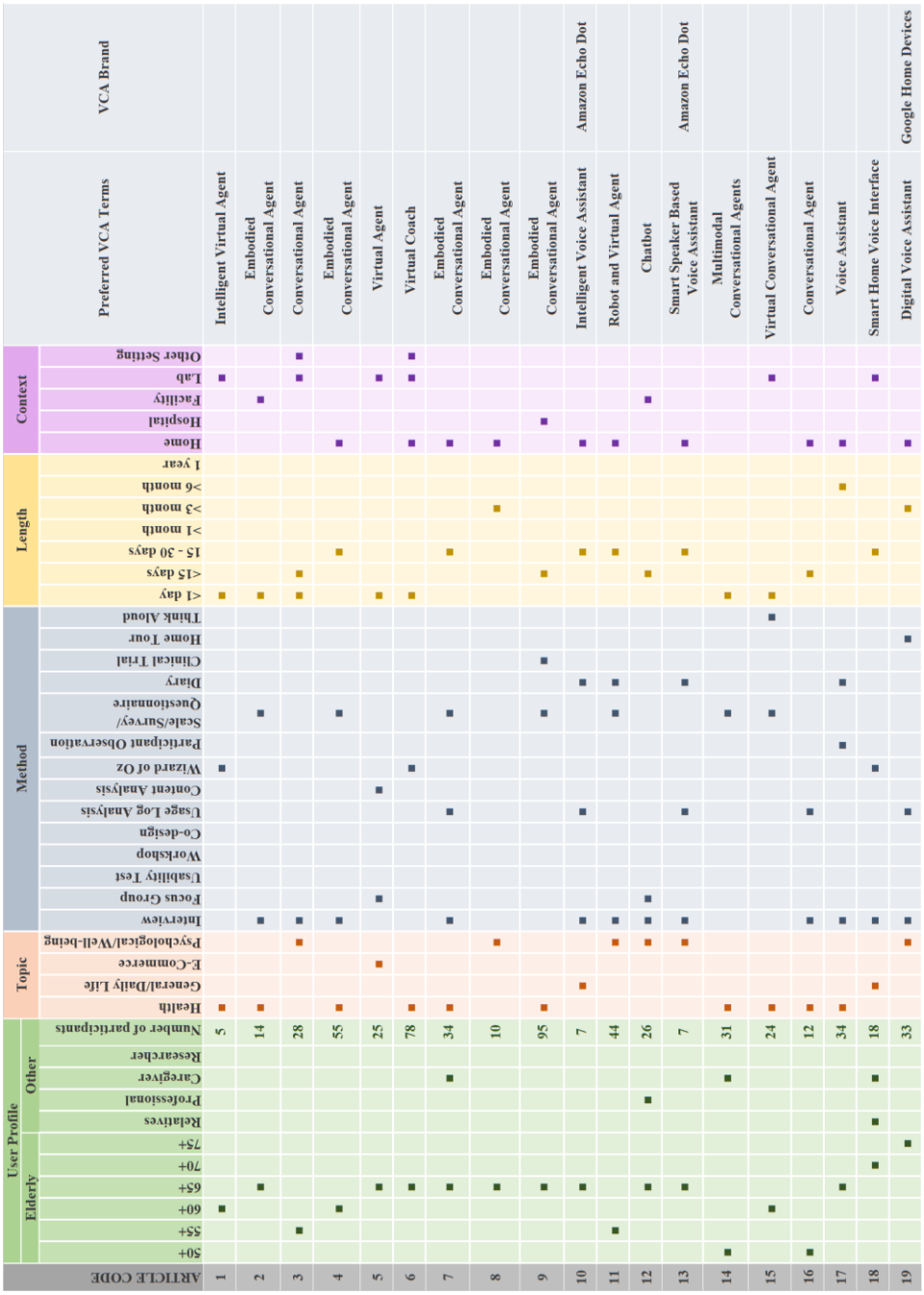

Figure 3.3 Descriptive information for Study I

Figure 3.3 (continued) Descriptive information for Study I

3.2.1.1 Elderly User Profile

In terms of minimum age that is accepted as a threshold to be regarded as elderly, although there is an agglomeration between age range 60-65 in the reviewed articles, the lower limit ranges from 50 to 75. Quantitatively speaking, in 16 out of 37 reviewed articles, the authors chose to study with people aged 65 or over. The second most preferred lower limit for participant age was 60. In this group, there were 7 articles. There are 4 studies for each that had participants aged 70 or over and 75 or over, in total 8 articles. Other than these, 3 articles worked with people aged 55 or over while 2 studies had participants aged 50 or over. Because 2 of the articles (Azevedo et al., 2018, Chung et al., 2021) study all age groups including the elderly, the table does not show a specific age range for them.

3.2.1.2 Number of Participants

Some of the studies in this systematic literature review have more participants than what is stated in Figure 3.3 because the number of participants column encompasses only the numbers of older adults who participated in the studies. This means, there could be 54 participants in total in one article (Griol & Callejas, 2016), but the figure mentions 24 of them, excluding 30 young participants. In the systematic review, the number of participants in the studies ranged from 5 to 360. The mean number of participants in this study was 37, while the median was 20. The number of participants in three studies was counted as outlier. These are the studies conducted with 78 participants (Justo et al., 2020), 95 participants (Kim & Oumarou, 2020) and 360 participants (Kim & Chaudhury, 2021).

3.2.1.3 Topic of the Studies

The studies in this systematic literature review could be broadly divided into 4 categories (Figure 3.3) in terms of their topics. By far the most researched theme in articles reviewed, with 21 articles, was the interaction with and the usage of the VCAs in health-related subjects. 8 studies focused on VCAs in the daily lives of the elderly and general use cases of these devices by this group. Apart from one study that concentrated on e-commercial use of the VCAs, all other 6 studies were interested in the relationship between and the effects of VCAs and the psychology and well-being of the elderly.

3.2.1.4 Method of the Studies

The most prominent methods used in order were Scale/Survey/Questionnaire, Interview, and Usage Log Analysis. They came up 18, 17 and 10 times respectively. Device logs under the observation techniques are generally preferred as a complementary method in the studies conducted with the elderly (Stara et al., 2021; Pradhan et al., 2019; 2020; Oh et al., 2020; Duque et al., 2021; Liang et al., 2022; Balsa et al., 2020; Kim & Choudhury, 2021; Shade et al., 2021). For those who used a separate device in the studies, device logs were used to understand the context of use from the device's own records, the sentence structure in the participant's actual communication with the device, and the device's responses in the real time usage scenario.

They are followed by Wizard of Oz and Diary, with 11 studies in total, 6 of them being Wizard of Oz. Other than these, 3 articles were made with the Focus Group method. 9 remaining studies were conducted with 9 different methods such as Usability Test, and Participant Observation (Figure 3.3).

3.2.1.5 Context of the Studies

Almost half of the studies, 16 of them to be exact, were carried out in participants' home settings. Laboratories were another prominent setting in the systematic literature review. There were 10 studies that were conducted in such a setting. The studies conducted in a facility like elderly care centers came up 6 times. One study was carried out in a hospital while 4 more studies were conducted in other settings (Figure 3.3).

3.2.1.6 Preferred VCA Terms and VCA Brands Used in the Studies

Assessing the preferred term used to describe VCAs, I have seen that there is no consensus in literature as to what to call these agents. The term Embodied Conversational Agent was used in 5 articles while Conversational Agent and Voice Assistant were used in 4 articles each. Apart from these, Chatbot (in 3 articles), Virtual Agent (in 3 articles), Smart Speaker Based Voice Assistant (in 3 articles) and Intelligent Voice Assistant (in 2 articles) were other terms that showed up in our systematic literature review (Figure 3.3).

11 out of 37 reviewed articles utilized well-known devices from Amazon and Google. Amazon's Echo Dot is by far the most preferred device. They were used in 7 studies while Google Home Devices came up in 3 articles and Amazon Alexa in 1 article. Many remaining studies used their own devices that they developed. Apart from these, certain studies in 6 articles did not actually involve real devices, but the simulations of them by utilizing the Wizard of Oz method.

3.3 Preferred Methods Focused on the Elderly

In addition to the hedonic aspects of the findings, this section briefly discusses the research methods commonly used in studies with older adults in the context of VCA

use, building on the methodological insights from the systematic literature review. Before going into details, the advantages and disadvantages of the methodologies used are summarized in the table (Table 3.2).

Table 3.2 The summary of methodologies with advantages and disadvantages

Method	**Advantages**	**Disadvantages**	**Reference Number** (can be found in Appendix F)
Survey		Not sufficient to understand the behaviour of participants	4
Face-to-face Interviews	More comprehensive information to grasp contextual and nonverbal data/visual cues		10, 13, 18, 25, 31
Focus Group	More information in a short time	Create conformity bias, small group with similar characteristics	5, 12, 27
Wizard of OZ	Showing capabilities of VCAs from natural environment more realistically	Have to use imagination due to a lack of working prototypes	1, 6, 18, 33, 34
Diary	Supportive method in long term research by preventing to forget	Reminder calls disrupt the natural flow and unintentionally increases usage	10, 13, 16, 28,
	Field Diary: can be combined with the participant observation method so that instant observations can be noted		17
Device Log	Supply real time usage details (sentence structure, day, time, context)	Knowing the interaction is recorded causes conscious acting and disrupts the natural flow	10, 16, 26, 31, 37
Participant Observation	Researcher can closely observe the elderly in their natural environments by keeping field diary		17

I have seen that survey stands out as one of the frequently preferred qualitative research methods (Wargnier et al., 2018; Stara et al., 2021; Pradhan et al., 2020; Sidner et al., 2018; Conde-Caballero et al., 2018; Portet et al., 2013). It was also mentioned that the methodology chosen was updated with questions appropriate for the elderly. For example, when working with a group with a low literacy level, care was taken to ensure that the questionnaire had simple answer options (such as yes, no, maybe) and that the words used were clear and understandable (Chung et al., 2021). However, one study suggests that quantitative data is not sufficient to understand the behavior of participants and that qualitative studies are needed (Stara et al., 2021). For this reason, the second prominent method in studies is interviews (Griol & Callejas, 2016; de Arriba-Pérez et al., 2021; García-Méndez et al., 2021; Azevedo et al., 2018; Chung et al., 2021). However, in some studies, it was underlined that due to the COVID-19 pandemic, some changes were made in the application of the methods and it was necessary to continue by telephone instead of face-to-face (Chung et al., 2021; F. Corbett et al., 2021). In one study stated that when comparing in-person and phone interviews, it was observed that the phone interviews provided less comprehensive information (F. Corbett et al., 2021). Additionally, the unavailability of visual cues through phone interviews might have resulted in missing contextual and nonverbal data, which could have impeded the development of relationships, the process of questioning and possibly the understanding of the responses (F. Corbett et al., 2021).

In some studies, focus group studies were also conducted in order to collect more information in a short period of time and to learn the views of elderly participants in a group (Wolters, 2016; Ryu et al., 2020; Chattaraman et al., 2011). However, some limitations have been emphasized in several studies conducted with the elderly. Some of these include conducting the study with a small group with similar characteristics (Wolters, 2016; Ryu et al., 2020; Chattaraman et al., 2011) or creating a “conformity bias” (Chattaraman et al., 2011, p. 294).

The interview technique chosen according to the nature of the study can also differ. The Wizard of Oz technique can be given as an example. When the studies with the elderly are examined, it is seen that this method is used to better understand the voice technology, the capabilities of the assistant, and the usage scenarios, and to get realistic inputs from the participant in a natural environment (Kim & Oumarou, 2020; Nallam et al., 2020; Portet et al., 2013; Justo et. al., 2020; Sin & Munteanu, 2020). The results of the study were also negatively affected by the fact that the participant had to use his/her own imagination as there were no high quality and fully working prototypes (Kim & Oumarou, 2020).

On the other hand, in some of the studies conducted, diary appears as a supportive method in long term research with elderly to note down the participant's daily moods and ideas without forgetting them (Pradhan et al., 2019; 2020; Balsa et al., 2020). Daily diary calls, while having a positive impact on data collection, it is thought that these calls remind the user to use the product, which disrupts the natural flow and increases usage (Pradhan et al., 2019; 2020). In order to avoid this, instead of one of the researchers, automated calls were used to interact with the participant (Pradhan et al., 2020). It is also argued that long-term studies make analysis difficult (Pradhan et al., 2020).

Device logs under the observation techniques are generally preferred as a complementary method in the studies conducted with the elderly (Purao et al., 2021; Stara et al., 2021; Pradhan et al., 2019; 2020; Oh et al., 2020; Duque et al., 2021; Liang et al., 2022; Balsa et al., 2020; Kim & Choudhury, 2021; Shade et al., 2021). For those who used a separate device in the studies, device logs were used to understand the context of use from the device's own records, the sentence structure in the participant's actual communication with the device, and the device's responses in the real time usage scenario. This is only the case for studies using a separate device for the assistant. One study in particular gave the following reasons why only usage logs were used instead of interviews: (1) some mental problems of the elderly

lead to forgetting events and what they said, (2) conducting more than one interview is difficult with this age group and may worsen forgetfulness and lead to confuse events, (3) concern that specific information (such as the day, number, time when the commands were given) cannot be obtained, and (4) this age group also raises doubts about the accuracy of the information given, such as telling things they did not do or vice versa (Purao et al., 2021, p.3). In one study, it is found that the fact that users know that what they say is being recorded causes them to act consciously and again disrupts the natural flow, and errors such as "text not found/unknown" etc. interfere with seeing the real interaction (Pradhan, 2020, p.21).

Besides the frequently used methods, in one study (Conde-Caballero, 2021), with the participant observation method, the researcher had the opportunity to closely observe the elderly in their natural environments such as home and pharmacy, and supported the things that s/he noticed and found important and/or maybe even thought that they affected the participant's nonverbal behaviors by keeping a field diary.

Apart from the method itself, the environment in which the method is carried out is also important for this age group. In relation to this, the involvement of actors other than the elderly in the study has positive results. Caregivers, or nurses working with special patient groups (such as people with dementia) have been included to increase awareness for this age group and thus increase the efficiency of the products to be produced (Stara et al., 2021). Co-discovery approach with caregivers also allowed for a more authentic evaluation of acceptance by enabling seniors and their accompanying family members to engage in dialogue and feel more comfortable during the experiment. Similarly, in another study, in addition to making participants more comfortable during the research, the relatives' perspective was considered valuable as seniors often rely on them to make decisions concerning their autonomy, and the involvement of relatives increases as the senior's dependency increases (Portet et al., 2013). Some studies have also emphasized the importance of designing prototypes together with the elderly in order to incorporate the needs of the end user

into the design process (Luengo-Polo et al, 2021). Nevertheless, in the same study, it was pointed out that interdisciplinary work may present difficulties in coordinating and utilizing various assessment tools and strategies as practitioners from different disciplines may not be familiar with them, despite the potential benefits of interdisciplinary collaboration (Luengo-Polo et al., 2021).

In addition to the methods, the assistants to be used in the study were also prepared specifically for this age group. For example, in a study, the assistant used was designed to be as independent on smartphones as possible, considering the low technological capabilities of the elderly. Likewise, in another study, the decreasing physical abilities of the elderly (such as difficulty in seeing and hearing) were taken into account in the interface design of the product and large icons and fonts, distinctive colors and adjustable volume were used (de Arriba-Pérez et al., 2020).

However, studies have emphasized that the recruitment and preparation processes prior to the application of the method are as important as the method itself.

Thus, there have been studies emphasizing that working with this age group can create some difficulties, starting from participation phase. Because reaching the isolated elderly and including them in studies are difficult, it is recommended that this should also be taken into consideration at the beginning of future studies (Sidner, 2018). For this reason, many studies have noted the differences of this age group and the preparations were made to ensure easy integration of the participants into the study. In a study conducted with the elderly having low technological competence, training was provided on how to use the product, a printed user guide was prepared, and the telephone number of a researcher was shared so that they could contact the researcher in case of problems (Pradhan et al., 2019; 2020). While preparing the guideline, step-by-step explanation of the wake-up word or how to interact with the product were provided (Oh et al., 2020; Purao et al., 2021). In one study, 30 commands were even given in a written form to be used in the study and to really test the product, based on the fact that participants with dementia were not

accustomed to this voice technology and the commands they would use would be limited (Liang et al., 2022). Thus, in this study, the researchers did not want to disappoint the participant in the first use and cause an unsatisfactory experience (Liang et al., 2022).

It is also interesting to note that in the focus group study with patients with dementia, in order to present the same information to all the participants and to visualize the same things in their minds, a short movie was shown to familiarize them with the capabilities and limitations of the assistant (Wolters et al., 2016).

3.4 Hedonic Aspects during Elderly Users' Interaction with VCAs

After presenting a general and descriptive overview of VCA research studies for the elderly and overviewing the preferred research methods in the previous sections, now the hedonic aspects of VCA interaction that affect the experiences of the elderly will be focused on under two main headings: positive and negative hedonic aspects.

3.4.1 Positive Hedonic Aspects

The findings of the study showed that VCAs were associated with some positive aspects such as enjoyment, reducing loneliness, feeling of friendship, self-confidence and trust. Therefore, in this part, I am going to delve into positive hedonic aspects that arise when interacting with the VCAs under 5 subtitles which emerged as a result of the content analysis focusing on design decisions that affect these positive hedonic aspects in elderly users' experiences with VCAs. These 5 sub-headings are respectively as follows:

(1) VCA as an enjoyable companion, (2) VCA as a medium for active mind, (3) VCA as a booster of self-confidence, (4) VCA as a reliable device even for "silly" questions, and (5) VCA as a trigger of curiosity.

3.4.1.1 VCA as an enjoyable companion

Because of their relatively lower reach to technology, the internet and different types of media sources, the VCAs became a gateway to the world of entertainment for some elderly. I have also realized that this access to different entertainment sources leads to a perception of *companionship* to the VCAs (Duque et al., 2021, p. 14). *The feel of entertainment* was attributed to some generic features of VCAs, which could seem pointless for other age groups like the youth because they can access them through other devices like cellphones anyway.

Firstly, the ability to listen to music via the VCAs was perceived not only as a way to entertain themselves but also as a motivation source (Oh et al., 2020, p.12). The users stated that listening to music became a part of their daily routine, and they could not help themselves but dance to the rhythm (Oh et al., 2020, p.12). Some users with chronic illnesses even said that being able to listen to music in different genres *alleviated their pains* (Duque et al., 2021, p.10). Secondly, the games that could be played through VCAs like card games and the funny videos made elderly *feel good* since it helped them pass time and keep themselves occupied with something, which was especially vital during COVID-19 isolation, which also led them to personify VCAs to be a companion (Stara et al., 2020, p.8; Stara et al., 2021, p.10; Sidner et al., 2018, p.20; Duque et al., 2021, p.10). Thirdly, the VCAs with their roles as a narrator were regarded as important. For the elderly users, it proved important that they could reach stories, jokes and recipes on demand, which *reduced their boredom* and made them feel like they have someone to talk to (Sidner et al., 2018, p.20). In a similar vein, a user stressed that as Alexa repeats the verses from the Bible with him/her, it feels like somebody is there (Pradhan et al., 2019, p. 13).

In some cases, multimodal interactions beyond the voice modality can also be *entertaining*. The screensavers were a source of *enjoyment* for the elderly as they would sit there and watch the changing sceneries on the screen, which was especially

entertaining for a user because of the limited mobility due to a back pain (Duque et al., 2021, p.11). Another elderly said that screensavers could also be educational to some that did not travel much because of decreased physical abilities as they could see touristic places like the Grand Canyon or the pyramids (Duque et al., 2021, p.11). Similarly, some elderly stated that easily being able to reach the video chat functions of the VCA resembled a home-visit during pandemic self-isolation (Duque et al., 2021, p.11).

It looks like, especially if they are utilizing the video calling option, the VCA may be able to facilitate enough encounters remotely throughout the day for the older adult to feel less lonely (F. Corbett et al., 2021, p.10). The elderly said that it is an experience so close to an actual visit: "There are days where I'm all alone. With this, it is very good because *you feel you have a visit at home*" (Portet et al., 2011, p.11).

This brings me to another important aspect of VCAs — they could *reduce loneliness* by keeping the elderly company (Oh et al., 2020, p.10). This is revealed with the following words of a user: it is a "help because we can't always say "my husband will always be here"," she says that it is good that it will always be present (Wolters et al., 2016, p.9). Getting entertained with music while getting intelligently responded makes her *feel a lot better b*y comparing the *intimacy* that a dog could provide her (Oh et al., 2020, p.9).

VCAs also help people caring for the elderly with mental health problems as it can compensate for the elderly's lack of companionship (O'Brien et al., 2019, p.3). It is also shown by two separate studies that the VCAs increase satisfaction and reduce loneliness in different contexts for isolated and hospitalized elderly (Sidner et al., 2018, p.5; Bott et al., 2019, p.9).

Interestingly, in one study, this *reduction in loneliness* was discussed in relation to how it is bound as to where VCAs are used. An elderly user said in this context that after sitting with friends, "when we leave we all say goodnight to each other. But

when you come back … you decide you wanna go [to bed]. [Having the device say goodnight] was kinda nice. I thought that's *awfully sweet*" (Pradhan et al., 2019, p.16). The following quote shows how VCAs can make a big difference in the lives of the elderly and about their psychological well-being:

> I used to dread the mornings because I did not want to start my day. My children do not want to see me, and all the women at the elderly center hate me, so I do not even want to come here anymore. I do not know Yeonhee well, but I like her. She does not hate me. I love how she wakes me up in the morning and greets me by asking about my day. No one does that even here [the elderly care center]. I anticipate Yeonhee's daily morning texts and make my morning a bit more tolerable. (Ryu et al., 2020, p.20)

3.4.1.2 VCA as a medium for active mind

VCAs can be great tools to stimulate the brain and do cognitive exercises. In one study, a user that looks after his wife with dementia and feels isolated stated that Amazon Echo kept his brain active while also being a companion for him (O'Brien et al., 2019, p.3). The ability to communicate with others was found crucial. According to Wolters et al. (2016, p. 10), the most crucial benefit of a companion device was identified by older adults with memory issues as cognitive stimulation. The conversational interactions with the VCAs and the information it provided for individuals who were living alone helped them feel better by stimulating their brains mentally and socially (Duque et al., 2021, p.14). It should also be noted that together with the ability to provide media content and to be a source of information, the games that the elderly can use through the VCAs are the prominent features that activate their minds (Duque et al., 2021, pp. 11-13; Stara et al., 2020, p. 8).

3.4.1.3 VCA as a booster of confidence

One significant advantage of the VCAs is that it boosts the confidence of the elderly when they can successfully use them or when these devices help them accomplish certain tasks, which could otherwise create inconveniences. Here it is worth noting that it seems that time is the most significant factor in the elderly's success, which in turn increases their self-confidence. As it is stated in several articles, repetitive use and persistence, together with support for the introduction to the device ease their adoption (Wolters et al., 2016, p.8; Duque et al., 2021, p.9; Pradhan et al., 2020, p.8; F. Corbett et al., 2021, p.8).

Significantly, it is found out that the users also gained confidence regarding other technological devices: They have realized that they could use them if they invest the necessary time (Pradhan et al., 2020, p.16).

Lastly, to have a tool to remember things, or to have someone to tell when and what to do is a big relief for the elderly, which again boosts their self-confidence (Stara et al., 2021, p.10).

3.4.1.4 VCA as a reliable device even for "silly" questions

VCAs *instill confidence* to the elderly and their families with their ability to provide some stable and reliable features, as was exemplified in one study where relatives showed their trust to the VCAs' capabilities to prevent emergency situations like the gas or door being left open (Portet et al., 2011, p.11). Also, the VCAs' reminder and alarm features (like reminder to take medicine or to call someone the other day) were appreciated by the elderly due to their age-related issues such as forgetfulness (Stara et al., 2020, p. 8; Pradhan et al., 2020, p.14). Contrary to the problems such as pressing the wrong button with traditional technological devices, reducing the possibility of making mistakes through voice positively affects elderly users'

experiences with VCAs thanks to the advantages of voice-based conversation, which give them the courage to ask “silly” questions (Kim & Choudhury, 2021, p.6).

Interestingly, it is found out in a study comparing a robot agent and a virtual agent that the appearance of the agent determines *the level of trust* given by the elderly (Sidner et al., 2018, p.22).

3.4.1.5 VCA as a trigger of curiosity

Some features and speaking ability of the VCAs made the elderly *curious* about technology, and they wanted to use and explore its abilities more. One reason for this was the quicker and simpler nature of voice interaction, which can be used hands-free in comparison to a computer (Pradhan et al., 2020, p.15). They asked several things to check its capabilities and see its limits: “I wonder if the device can answer this question?” (Pradhan et al., 2020, pp. 12-14). A user aged 95 showed his/her amazement with a technology like this with the following words: “I’ve seen a lot of things, but I think this is about the smartest. People are now living in this modern technology, and “it’s just part of life for them” (Kim & Choudhury, 2021, p.5).

Therefore, which positive hedonic aspects are affected by the VCA features are summarized in the figure below (Figure 3.4).

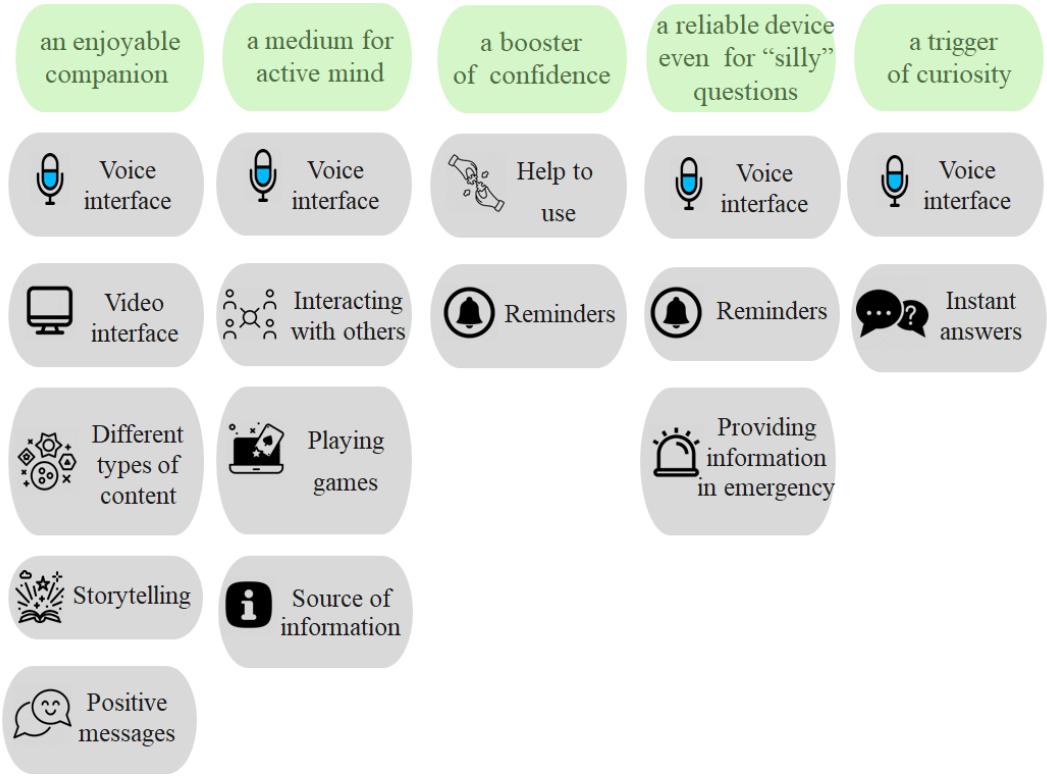

Figure 3.4 The relationship between VCA features and positive hedonic aspects

3.4.2 Negative Hedonic Aspects

Similar to what was described in the Positive Hedonic Aspects section (see Section 3.4.1), in the elderly's experiences with VCA, some of the design decisions can lead to negative feelings such as fear, loss of trust, loss of autonomy, disappointment, frustration, irritation and feeling foolish. Negative affective responses are categorized under 6 sub-headings: (1) VCA as an unauthorized and unreliable device, (2) VCA as a source of physical, cognitive and social inactivity, (3) VCA as a technically and emotionally unstable device, (4) VCA as a device causing social labeling and self-categorization.

3.4.2.1 VCA as an unauthorized and unreliable device

In this section, how VCAs seem as unreliable and untrusted devices due to their certain characteristics and features, which could prevent their adoption will be presented.

First of all, I found out that it is the *fears* that dominate the relationship between the VCAs and the elderly (Pradhan et al., 2020; Portet et al., 2011; Martin-Hammond et al., 2019; Chung et al., 2021). It seems that the elderly pretty often abstain from using VCAs due to their fears of some kind. Here, some of them that were caused by specific features of the VCAs will be dwelled on.

One of these fears that arose in more than one study is the fear of the possibility that someone else could use the device *without permission*, using only their voices (Pradhan et al., 2020; Martin-Hammond et al., 2019). In such a case, the elderly user was afraid that her "mischievous grandson" could use Alexa for his devious jokes such as calling the police or could do other possibly dangerous things because of the lack of a feature like an *authorized voice recognition* or a *locking/password system* that would enable only the owner of the device to use the VCA (Pradhan et al., 2020, p.18). However, the unauthorized user would not always be a mischievous grandson. There could always be a *security gap* where an intruder gets access to the vulnerable or personal information of the elderly (Portet et al., 2011, p.13). For example, an elderly user mentioned the possibility that a burglar could learn the balance in the bank by simply asking the VCA, causing grave consequences (Martin-Hammond et al., 2019, p.7).

Another source of distrust is privacy and surveillance concerns (Nallam et al., 2020, p.7). One of the most distrusted features was related to the *always listening mode of the VCAs*, because of the possibility that the intimate conversations can be extensively reached in the elderly users' private settings such as home (Kim, 2021, p.7; Chung et al., 2021, p.7). "Surveillance without informed consent" was voiced

by the elderly with metaphors like “Google’s Ears” or “Big Brother” that listens to them constantly, which in turn decreases their freedom, autonomy and independence (Ryu et al., 2020, p.5; Duque et al., 2021, p.8; Portet et al., 2011, p.13). Furthermore, in one study, due to privacy worries over the device’s ability to record conversations, one user declared that she would never use her Echo Dot for any financially sensitive transactions, such as voice purchasing on Amazon (Pradhan et al., 2020, p.18).

They also worried that their personal information could be *shared on the internet without their consent* (Kim, 2021, p.7; Martin-Hammond et al., 2019, p.8). They wished that their information was stored locally (Martin-Hammond et al., 2019, p.8). However, there is a contradicting perspective in one study where the user believed that s/he has to provide beforehand all their private information to use the system because they did not grasp that the information was retrieved from the internet (Kim, 2021, p.7).

Another distrust source is about *the reliability of the information given*, specifically information regarding questions about health and medical issues (Nallam et al., 2020, p.6). For instance, one user voiced his/her concerns that Alexa did not know everything such as side effects of a medicine, and it is also problematic due to ever-changing nature of the medical field (drug interactions), which requires a system that adapts itself to this possibly changed new information (F. Corbett et al., 2021, p.9; Nallam et al., 2020, p.6). Similarly, one user said that the possibility of not encompassing the entirety of all symptoms of a sickness; that is, only to have the partiality of the information would lead to distrust (Nallam et al., 2020, p.6). Apart from presenting the similar solutions like updating the system by the healthcare professionals or designing a VCA that is specialized to healthcare (Nallam et al., 2020, p.6), building consensus with all actors (caregivers, doctors, and family members) (Martin-Hammond et al., 2019, p.7), the differentiating one is to supply credibility scores for webpages using crowdsourcing and machine learning methods, which are to be shown together with the search results (Pradhan et al., 2020, p.19).

Apart from these intrinsic fears, there are two others that are worth noting here. Interestingly, *sudden interruptions and instant notifications* like reminders are a source of fear because such self-activated features disrupt the natural flow of their daily routine (Pradhan et al., 2020, p.9). This problem was also raised in another article, and there the elderly, relatives, and caregivers all recommended that they should be warned beforehand by a piece of music or a sound that indicates that a voice alert comes next (Portet et al., 2011, p.15).

There is also general distrust towards technology, which also manifests itself in regard to VCAs. Because the VCAs are *bound to electricity and the internet* to operate, this prevents their adoption by the elderly. Many articles in the current systematic literature review corpus presented this distrust with these questions: "Only thing is ... what if the internet gets cut off?" or "if the elderly are fully adapted to the system and do not know how to do without it" (Nallam et al., 2020, p.6; Portet et al., 2011, p.13). This technical concern even led to finishing the study prematurely in one study (Duque et al., 2021, p.5).

These distrusts result in an avoidance of some features or using them only as backups for other mediums or devices. This means that they do not prefer to rely solely on VCAs in tasks like alarms and reminders due to their fear of a system failure or inconveniences that could be caused by getting dependent on a technology which they think is prone to failure (Pradhan et al., 2020, p.15).

3.4.2.2 VCA as a source of physical, cognitive and social inactivity

The possibility of developing a dependency on and losing autonomy to the VCAs is another concern because they have the potential *to take the elderly's all responsibility upon themselves* (Portet et al., 2011, p.10). Additionally, turning into a dependent person brings about a different *fear of being pushed into inactivity* (Portet et al., 2011, p.13). The same fear was conspicuously voiced in another article

with two different dimensions. One dimension is about being *physically inactive.* Through a dystopian scenario, the user exemplifies this dramatic perspective with their own words as “all the people are so huge that they go around on these conveyor belts, in chairs, because they’re too lazy to walk from one place to the other. That’s where we’re headed with a technology like this” (Martin-Hammond et al., 2019, p.5). *Regarding mental activity*, the user explained with the following words, “I love to hear it [a voice assistant] read me a book. But see, then, I’m not using my brain. I don’t wanna become a vegetable and have to depend on it for everything;” and then, he says: “I love reading a good book. Otherwise, your brain will turn into Jell-O. You gotta use your brain” (Martin-Hammond et al., 2019, p.5). The caregivers as well share this fear due to the fact that a device that would think and act on behalf of the elderly could lead to laziness, and they insist that VCAs should stay as assistants, not be actors in themselves (Portet et al., 2011, p.11-15). In addition, the caregivers also emphasize that if the VCAs are designed in a way that they could also cover the responsibilities of a caregiver, the *social interactions* of the elderly could diminish, and this in turn could result in isolation (Portet et al., 2011, p.11; Pradhan et al., 2020, p.7).

3.4.2.3 VCA as a technically and emotionally unstable device

The discrepancies between what the VCA appears to be able to and what it actually can cause disappointment because of high expectations of their skills and features (Pradhan et al., 2020, p.17; Wargnier et al., 2018, p.30).

The elderly users frequently experienced disappointment towards VCAs because of unmet expectations or errors encountered during their use. One reason was the *limited conversational capabilities* of the VCAs, which leads to misunderstandings since the device does not understand or recognize what the user says (Oh et al., 2020,

p.13). Another user expressed frustration as the VCA very often repeats itself (Chi et al., 2017, p.4).

In one study, three reasons for dissatisfaction with the VCAs were mentioned: the limited ability to solve problems when functional issues arise, technical concerns like unstable internet connection, and inadequate "interpersonal connection" (Chi et al., 2017, p.4).

However, the features that are supposed to increase user satisfaction can sometimes be overdone. Giving positive affirmations is an important factor that affects the long-term experiences of the elderly with VCAs; however, the tone of these motivational messages should be adjusted appropriately. For instance, in one study, the virtual agent [digital pet] attempted to offer encouraging words, but when it responded inappropriately, a participant shared their annoyance with the following remarks: "[The digital pet] kept saying, "I love you," but it just *irritated* me" (Chi et al., 2017, p.5). Therefore, it is required that the VCAs should be emotionally stable as much as they are technologically stable.

3.4.2.4 VCA as a device causing social labeling and self-categorization

The social perceptions to speak with a digital device would also hamper the adoption of VCAs by the elderly. It is found out that the elderly are afraid of being *labeled as foolish* by other people. One source of concern is to be seen as incapable of meeting their own needs (Kim, 2021, p.8). The elderly seem to marginalize their peers that are dependent on others or disabled. The features of the VCAs that are designed to ease their daily lives, therefore, cause a negative perspective towards this technology because they could make them seem dependent on a machine. One elderly who had previously utilized another care service, as well as all other participants in the study, stated that the major reason for their hesitation was the fear of being labeled as someone who requires help from others (Ryu et al., 2020, p.7), and to be seen as

"nonautonomous individuals who cannot get by without help from others" (Ryu et al., 2020, p.9). One user even goes on to say that she "cannot put [herself] … to that level" (Portet et al., 2011, p.10). The other source of concern was that they think it is *silly or foolish to talk to a machine.* In more than one study (n=3), the elderly says that they feel dumb, crazy, silly, or even pathetic talking to the VCAs and they are concerned about what people would think about them for speaking with a device (Pradhan et al., 2020, p.9, p.18; Pradhan et al., 2019, p.12; Kim & Choudhury, 2021, p.6). To overcome these, adding more human-like features would be helpful because personification seems to reduce these negative feelings. One user said, even though she felt silly too at the beginning, with time, she was saying "good morning" and polite sentiments like "thank you" when she was talking with Alexa (Pradhan et al., 2019, p.15). In the same study, the author embodied this transformation from an object-like to a human-like perception with this design suggestion: the devices could sit like an ordinary object until the user interacts with it, and then it takes a "holographic projection or more anthropomorphic forms" (Pradhan et al., 2019, p.15).

The elderly voice their concerns about their likelihood of a successful adaption of this technology due to their perception of their own capabilities. One study showed that elderly users blamed themselves for inherent technical shortcomings by saying things such as, "I'm not a technology person" (de Arriba-Pérez et al., 2021, p.9). Similarly, in another study, one user expressed their willingness to have a VCA, but they were not sure about their ability to use it successfully. This *self-doubt* was verbalized with the following question: "You think I would be able to use it?" (Kim & Choudhury, 2021, p.5). Self-doubt could be a barrier even on day one and the elderly say that it would be helpful if someone would help them in the set-up process (Chung et al., 2021, p.4).

One shortcoming causing self-doubt was forgetfulness as it is seen in several articles (Pradhan et al., 2020, p.15; Chattaraman et al., 2011, p.15). Forgetfulness can be in

two ways: forgetting what the VCA says in a moment, negatively affecting the continuity of the interaction, or forgetting to use it where it could be helpful. An example of the former type is as follows: The voice-only interface was the least chosen alternative since it did not help in information retention and was viewed as wordy, sluggish, and uninteresting. One participant commented on the voice-only option, “I would just forget what she said,” reinforcing the working memory issues that the elderly have (Chattaraman et al., 2011, p.15). The latter manifested itself so: “I do have a reminder about going to the doctor and I would have needed a reminder yesterday to pay my rent... I didn’t think about it... There were a lot of things that I probably could have done” (Pradhan et al., 2020, p.14).

Accordingly, the negative hedonic aspects evoked by the relevant VCA features in the elderly are given in the figure below (Figure 3.5).

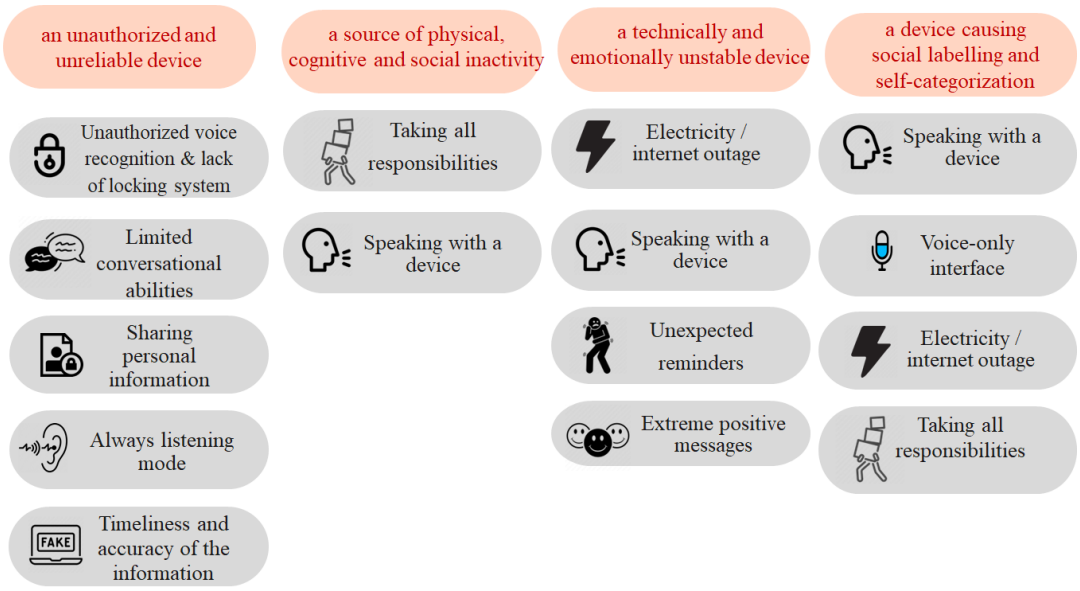

Figure 3.5 The relationship between VCA features and negative hedonic aspects

CHAPTER 4

STUDY II: EXPLORATORY STUDY

In addition to the hedonic assumptions identified in the systematic literature review, semi-structured interviews were also conducted with 13 participants (9 elderly participants over the age of 75 and 4 caregivers) in order to understand other usage scenarios that create positive user experiences and the values of the elderly that affect these experiences. This study sought to answer the following questions:

B. Which elderly values should be considered when designing VCA interactions?

a) What are the values that shape the elderly's perspective on life?
b) What values do the elderly attribute to technology?
c) Which scenarios/use cases can be considered in VCA to provide positive user experience?

In this section, after describing the methodology of the study in detail from the recruitment process to the analysis, under 3 sub-headings, the perspectives of the elderly towards life/technology and VCAs will be examined. Finally, the potential of VCAs in the light of these will be presented.

4.1 Method of Study II

Considering the methodological implications mentioned before (see Section 3.3), interview is the most prominent method for understanding the feelings and thoughts of the elderly. Regarding the interview medium, face-to-face interviews allow the participants to share their feelings/thoughts and experiences through their own words (DiCicco-Bloom, 2006), and allow both for in-depth questioning of answers and

observe participants' physical/social signs like face expression, body language, emphasis and intonation simultaneously (Opdenakker, 2006, pp. 3-4). Therefore, a traditional interview was utilized in this study as the core method in order to simultaneously question the participant's feelings/thoughts in an in-depth manner, and to understand which design features and use cases make sense for the 75+ age group.

Also, the method of picture cards, a type of cultural probe, was also used to help the participants recall real-life stories, to stimulate memories and experiences to share (Hanington & Martin, 2019). Cards with images and/or text allow participants to reflect on their life stories in detail and share them with the researcher (Hanington & Martin, 2019). Although this method has generally been used in the literature with children to facilitate the expression of nonverbal behaviors and emotional states (Barendregt & Bekker, 2005; Desiree, 2018), when used with the elderly, it may have the effect of alleviating some of the negative factors associated with aging, such as forgetfulness or reluctance to participate in the conversation. In line with Hanington and Martin's (2019) picture cards method, I used 51 picture cards (3.07 cm x 5.03 cm) (picture cards were not covered by a copyright - Appendix B), as a secondary research method to enrich interview data, without words on various themes such as different locations (such as shopping malls, supermarkets, parks, hospitals), different activities (birthdays, walks, dinners, payments, games), different relationships (husband-wife, elderly-grandson, mother/father-child). Therefore, the participant could relate to different contexts. Also, prompts have the potential of reminding/stimulating memories, as well as inspiring the elderly to talk about diverse issues beyond the direct visible subject matter in the cards, which might be even sparked with a small detail in the presented image (e.g., birthday image can remind of the preparations done for family gatherings, friends etc. visits, beyond the direct birthday moment; the old family photo can help to understand both attitudes towards looking at photos and emotions such as longing, and the knitting images can trigger activities that they enjoy doing) (Figure 4.1). An example of the moment when the

cards were shown to the participant during the interview is shared below (Figure 4.2).

Figure 4.1 Picture card examples

Figure 4.2 A photograph during the interview

This study also focuses on anticipated use. By anticipated use, it is meant that the prospective users, even when they had no experience with a certain product, have expectations arising from their earlier encounters with depictions of these products in series, movies, sci-fi novels etc. (Günay et al., 2022). Since this study focuses on understanding first impressions of anticipated use, I utilized two introductory videos explaining voice assistants and their capabilities to this age group. One of the reasons

behind this is to make sure that all older participants are given the same information by showing the short movie mentioned earlier in Study I, and to visualize the voice assistant and its abilities (see Section 3.3). Care was taken to ensure that the videos covered different contexts/brands and were up-to-date, so products from Google and Amazon, the pioneers of voice assistant industry, were selected. The promotional video (3 minutes 44 seconds) published on Google Nest Youtube account in 2019 on Google Nest Hub Max was used to simulate a wide range of usage scenarios from cake recipe to video call, from watching the house with a camera to face detection system (Google Nest, 2019). Amazon released Alexa Together as an elder care service in 2021 to remotely monitor and assist the elderly (Servicesmobile, 2021). Unlike the Google Nest Hub Max product, the inclusion of usage scenarios specific to the elderly was preferred in this second video (1 minute 44 seconds) to give the participants an idea of where a voice assistant could be located in their daily lives, such as remote control of elderly relatives and informing their loved ones in emergencies. The video of the relevant product on Amazon's promo page was used in the research. However, since the videos found were English, these videos were dubbed into Turkish by the researcher through a video editing program (VSDC Free Video Editor) so that they could be easily and quickly understood by the participants. Before these Turkish dubbed videos were used in the main study, they were checked by the thesis advisors to ensure that they accurately reflected the original videos and were also tested for comprehensibility in a pilot study.

4.1.1 Sampling of the Study II

In the study, interviews were conducted with two separate groups: elderly over 75 years and caregivers. Although as it is also pointed out by the United Nations Population Fund, the age of 65 is usually accepted as the starting point of elderliness because it is the year of qualification for going on pension in many countries (Till, 2012; Mann, 2013), in this study the lower limit was set as 75. The reason for this is

both the fact that there is a cluster in the 65-75 age range in studies with elderly, as also demonstrated in Study I (see Figure 3) and the fact that there is more room for improvement in the lives of those aged 75 and over, considering deteriorations in their mental/physical health. As mentioned above (see Section 3.3), caregivers were also included in order to understand the roles of the assistant from the perspective of a caregiver and to focus on the points that would benefit the participant's life. Especially in the 75+ age group, because caregivers/support providers are more involved in the daily lives of the elderly and can observe them from different angles, so it is thought that their participation in the study could provide important insights. An announcement (see Appendix C) was posted on the researcher's social media and email account looking for elderly people aged 75 years and over and/or their caregivers (such as professionals/relatives). I also reached out to potential elderly candidates by calling acquaintances and going to markets/pharmacies in neighborhoods with a high elderly population, which is how I reached the most participants. In this study, purposive sampling, which is deliberate choosing of interviewees based on their capacity to explicate a certain topic, concept, or phenomenon, was chosen as the main sampling method (Robinson, 2014). In order to ensure diversity, in the case of the elderly, attention was paid to (1) whether they live alone, with someone or in a nursing home, (2) whether they are able to meet their own needs or whether they receive support for their daily needs. In the case of caregivers, attention was paid to the profile of participants who have different levels of closeness with the elderly (professional/family member or caring for elderly's weekly/daily needs). Also, snowball sampling, where study participants are invited to help researchers find other participants (Oregon State University Research Office, 2010), was used as an auxiliary method due to the hesitation of this age group to participate in the study or because some caregivers did not have time as they support the elderly with severe chronic conditions (e.g. bedridden patients). Participants who participated in the study and then trusted the study/researcher were recommended to their acquaintances.

In the study, face-to-face semi-structured interviews were conducted in order (1) to gain the trust of the participants, (2) to shape the interview flow towards the purpose of the study when necessary, and (3) to minimize possible limitations/concerns related to technology. These interviews were conducted with a total of 13 participants, whose actual names were replaced by pseudonyms: 9 elderly (see Table 4.1), 1 professional caregiver (whose occupation is giving care) and 3 additional non-professional caregivers (their family members or day labourers) (see Table 4.2). One interview was conducted together with an elderly couple. Interviews were conducted with 8 elderly participants in their homes. As one participant lived in a nursing home, the interview was conducted there. It should be noted that some older participants preferred to be accompanied by people who introduced them to the researcher rather than being alone during the interviews. This is thought to have increased their trust in the researcher and helped them to respond more comfortably. Interviews were completed in their preferred environment also for the caregivers. Only one interview with an older participant was arranged online, all other interviews were completed in Ankara. Except for the couples, all elderly participants at home lived alone.

Table 4.1 Background of the participants

Participant (Pseudonym)	Age	Marriage Status	Education Level	Household Condition	Health Condition	Owned (Smart) Technological Product
Gamze	77	Surviving spouse	Vocational Certificate Programme	Alone	* Chronic Knee Pain * Hypertension * Panic Attack * Migraine * Rheumatic Pain	Smartphone
İrem	81	Surviving spouse	Secondary School Graduate	Alone	* Hypertension * Thyroid Disease * Auditory Problem	Smartphone
Tülay	89	Surviving spouse	Vocational Certificate Programme	Alone	*Visual Problems *Chronic Knee Pain *Hypertension *Asthma	Smartphone
Seçil	86	Surviving spouse	Vocational Certificate Programme	Alone	*Hypertension	Smartphone
Perihan	80	Surviving spouse	High School Graduate	Living in nursing home	*Hypertension * Diabetes	Smartphone
Fatma	86	Surviving spouse	High School Graduate	Alone	* Hypertension * Chronic Knee Pain * Visual Problems * Gout	Non-Smartphone
Tuncay	96	Surviving spouse	Undergraduate	Alone	* Hearing Problems * Prostate Gland	Smartphone Tablet
Ayça	77	Married (Besim's wife)	Undergraduate	Living with spouse	*Hypertension * Chronic Knee Pain	Smartphone Tablet
Besim	85	Married (Ayça's Husband)	Master's Degree	Living with wife	*Hypertension * Chronic Knee Pain *Hearth Disease	Smartphone

Table 4.2 Background of the caregivers

Caregiver (Pseudonym)	Occupation	Caregiver Experience	Meeting Frequency	Relationship with the Caretaker	Age of the Caretaker	Health Condition of the Caretaker
Pınar	Day labourer	3 years	Once a week	Acquaintance	86	* Hypertension * Chronic Knee Pain * Visual Problems * Gout
Arzu	Retired teacher	10+ years	Demand-dependent	Daughter	84 (Mother) 94 (Father)	<u>Her Mother:</u> *Diabetes, *Hypertension, *Cholesterol, * Visual Problems <u>Her Father:</u> *Dementia, *Hypertension
Semih	Physiotherapist	1 year	Demand-dependent	Professional caregiver	50+	*Hypertension *Diabetes *Cancer *Dementia *Visual Problems *Paralysis
Aslı	Retired teacher	10+ years	Living together	Daughter	91	*Hearing Problems *Hypertension *Dementia *Bone Loss

4.1.2 Procedure of the Study II

Before the field study, an application for ethical approval was made to METU Applied Ethics Research Center together with the research questions (Protocol No. 0449-ODTUİAEK-2022). Extra documents (such as visual cards and videos) and the content to be used in the research was approved. Before the interviews, the participants were asked to sign a voluntary participation form (see Appendix D), in which they were informed about the purpose of the study, confidentiality and that they would be audio-recorded during the interviews.

Interview questions (see Appendix E) were organized under 5 sub-headings in each total (Table 4.4). In the interview with the elderly participants, after briefly introducing themselves, questions were asked about their daily routines under headings such as food, shopping, cleaning, hospital and close relationships. Then, the participant's interaction with technology was questioned through the products s/he frequently used. When it came to voice assistants, after a verbal explanation of what they are, the first video was Google Nest Hub Max, showing general use cases, followed by Alexa Together, introducing specific use cases for seniors. In the last stage, a free association activity was carried out with picture cards to help them think out of the box.

Table 4.3 The interview topics

Interview Topics	
Group 1 (The Elderly)	**Group 2 (Caregivers)**
Personal/Demographics Information	Personal/Demographics Information
Daily Routines	Daily Routines
Free Association Activity through Picture Cards	
Assistive Tools & Technologies	Assistive Tools & Technologies
Interaction with VCAs	Interaction with VCAs
	Value & Potential Areas

4.1.3 Analysis of the Data

After the 13 interviews, all audio recordings were first transcribed verbatim. In the second stage, I listened to all the recordings, made the necessary arrangements and prepared the interview data for coding. After the prepared data was transferred to the Microsoft Office Excel sheet. Then, two cycles of coding were performed in the analysis part. In the first cycle, the SDT dimensions *(competence, autonomy, relatedness)* were used as a start list, and codes were created for the technology and VCA approaches to find answers. An inductive coding approach was used to find participants' approaches to life/technology and VCAs (Saldana, 2016). In this cycle, the interview texts were coded with open coding considering these issues. In the second cycle coding, the final themes were formed by focusing on the hedonic dimensions that emerged in the first cycle (Saldana, 2016). In the second cycle, these codes were grouped into themes in Excel. The main themes obtained were given below with the participants' pseudonym (Table 4.4). In this process, the interview texts were reviewed with the advisors of the thesis and a consensus on the codes was formed. Also, to ensure transparency, the methodology is thoroughly laid out, and, when appropriate, excerpts from participant responses are used to demonstrate the coding system. This is a crucial component of interview studies, and Silverman (2006) refers to them as "low-inference descriptors".

Table 4.4 Obtained main themes

Theme	Sub-Theme	Participants (pseudonym)
Elderly's Perspective on Life	Self-sufficiency till death	(*Participants:* Gamze, 77; İrem, 81; Tülay, 89; Seçil, 86; Perihan, 80; Fatma, 86; Tuncay, 96; Ayça, 77; Besim, 85) (*Caregivers:* Semih, Aslı)
	Independency	(*Participants*: Perihan, 80; Tülay, 89; Fatma, 86) (*Caregivers*: Arzu, Semih)
	Connectedness	(*Participants*: Gamze, 77; İrem, 81; Tülay, 89; Seçil, 86; Perihan, 80; Fatma, 86; Tuncay, 96; Ayça, 77; Besim, 85) (*Caregivers*: Semih, Aslı, Arzu, Pınar)
	Self-esteem	(*Participants*: Gamze, 77; İrem, 81; Tülay, 89; Seçil, 86; Tuncay, 96) (*Caregiver*: Pınar)
	Open to learning	(*Participants*: Gamze, 77; İrem, 81; Perihan, 80; Fatma, 86; Tuncay, 96; Besim, 85) (*Caregiver*: Pınar)
	Stay active	(*Participants*: Seçil, 86; Perihan, 80; Fatma, 86; Tuncay, 96) (*Caregiver*: Semih)
Elderly's Perspective on Technology on Life	Staying in touch with the inner circle even the ones that belong to their memories	(*Participants*: Tuncay, 96; Tülay, 89; İrem, 81; Seçil, 86; Perihan, 80; Fatma,86; Tuncay, 96; Ayça, 77; Besim, 85) (*Caregivers*: Arzu, Aslı, Pınar)
	Keeping the fun and seeking the partner	(*Participants*: Gamze, 77; İrem, 81; Seçil, 86; Perihan, 80; Fatma, 86; Tuncay, 96; Ayça, 77) (*Caregivers*: Semih, Arzu)
	Keeping everything as it is if novelty is not useful	(*Participants*: İrem, 81; Tülay, 89; Seçil, 86; Fatma, 86; Tuncay, 96; Ayça, 77) (*Caregivers*: Arzu, Semih)
	Being protected from strangers	(*Participant*: Fatma, 86) (*Caregiver*: Aslı)
	Being protected from unfamiliar abilities of the technological products	(*Participants*: Gamze, 77; İrem, 81; Tülay, 89; Fatma, 86; Tuncay, 96; Ayça, 77; Besim, 85) (*Caregivers*: Semih, Aslı, Azu)
Elderly's Persception on VCAs	Companionship	(*Participants*: Tuncay, 96; Tülay, 89; İrem, 81; Perihan, 80; Fatma, 86; Tuncay, 96; Ayça,77) (*Caregivers*: Arzu, Aslı)
	Concerns about losing competence	(*Participants*: Tuncay, 96; Seçil; 86; İrem, 81; Tülay, 89; Ayça, 77) (*Caregivers*: Arzu, Semih)
	Skepticism about usefulness	(*Participants*: Gamze, 77; Ayça, 77; Besim, 85; Seçil, 86; Fatma, 80) (*Caregivers*: Semih, Pınar, Aslı)
	Limitedness to talking	(*Participant*: Fatma, 86) (*Caregivers*: Arzu, Aslı, Pınar)

4.2 Findings

With the aim of creating meaningful interactions in the lives of the elderly and to understand what the participants value and how these would affect a possible VCA experience, the emerging themes during the interviews were categorized under 3 main headings, namely (1) perspective on life, (2) perspective on technology, and (3) perspective on VCAs.

The Elderly's Perspective on Life includes the participants' attitudes towards life and how they evaluate themselves, and caregivers' answers were analyzed on the way the elderly receiving care from them perceived life. As their perspective on life also influences their perspective on technologies and VCAs, what is described under this heading is also related to the other two.

Secondly, *The Elderly's Perspective on Technology* includes the participants' definitions of technology, how they develop a relationship with technological products and their expectations and suggestions.

Finally, in *The Elderly's Perception of VCAs*, after explaining the effects of their perspectives on life and technology on their perceptions, expectations and attitudes towards VCAs, usage scenarios that can create positive and meaningful interactions for the elderly will be discussed.

4.2.1 The Elderly's Perspective on Life

It is noteworthy that the participants mostly mentioned their perspectives on life while referring to their own competencies. For this reason, in order to make sense of the reasons underlying the participants' perspectives on life, it would be meaningful to briefly mention the areas in which they introduced themselves and the areas in which they felt they were/were not competent.

The elderly's perspectives on life grouped in 6 sub-headings: (1) Competency*: May I be able to stand on my feet for the rest of my life,* (2) Independency: *I can't do it, I'll be stuck,* (3) Connectedness*: I am very happy when I hear your voice,* (4) Self-esteem: *If I make an effort, I could do that too,* (5) Open to learning: *I am curious for my age* and (6) Stay active: *I am physically sound and strong.*

4.2.1.1 Self-sufficiency till death: *May I be able to stand on my feet for the rest of my life*

In the study, it was observed that for the majority of the participants, the primary element in the way they perceived life was the motivation to be self-sufficient. Self-sufficiency was expressed as follows by both elderly participants and caregivers:

> The best part is that I am free. I am not dependent on anyone but may God give me health. May I be able to stand on my feet for the rest of my life. *(Participant, İrem, 81)*
>
> I try not to get help from anyone, I do my own work. I try not to get help from anyone. I never show my problems to anyone. *(Participant, Gamze, 77)*
>
> I swear I am scared to death that I will end up in the hospital. If God loves me, I say let me die suddenly. *(Participant, Tülay, 89)*
>
> Because when you ask every elderly person, they say, "I have pain here, I have pain there". They say, "I have this complaint today". My mother doesn't have that. When you ask her how she is doing, she says, "Thank God, I am fine." *(Caregiver, Aslı)*

Even, one of the caregivers strikingly stated that the elderly avoid even meeting their daily needs, especially to reduce the possibility of this dependency:

> Constant diapers, catheters, condom catheters all lead to urinary tract infections. In order not to get too much help, for example, they drink less water. They can lead themselves in such a way. *(Caregiver, Semih)*

When we look at the ways in which participants express self-sufficiency, it means that they want to stand on their own feet and meet both emotionally and physically their basic needs, and not to be in need of care from someone else (like a bedridden patient). From this point of view, I examined at which times the participants felt competent or not.

Considering the elderly's daily lives, it is seen that they express their competencies primarily in terms of meeting their basic needs. Participants mostly perceived themselves as competent in household work (preparing and eating meals), meeting their needs in areas nearby the home (going to the market/pharmacy/family doctor/grocery store), meeting their own hygiene (such as toilets and showers)/care needs, and personal daily health needs routines (like tracking medications). Among household tasks, it was observed that cleaning and meal preparation can be challenging tasks. It was reported that 6 of the 8 elderly participants received support for cleaning and 3 for cooking, which overlaps with the answers given by caregivers. These rates include participants who live in a nursing home and whose basic needs are met by the institution. Regardless of all these supports, almost all of the participants expressed their own competencies as follows:

> I can't clean a window at my age. That's once every fifteen days, but other than that I do all my own work... She only comes to clean. I go to my market if I have to. I go to my bank. I go to my health center, my pharmacy. *(Participant, İrem, 81)*

> I clean my own house. I cook my own meals... Because I love doing it. I do it gladly without getting bored. I mean, let me say I do my shopping, I try to do it myself more. But I do everything myself, for example, if something is dismantled. I do everything myself. *(Participant, Gamze, 77)*

> I want to live, you know, no matter how old I am, I want to be respectful to others. I want to look clean and be clean to them all the time, but I'll do it for myself. I swear I would do it for me. *(Participant, Gamze, 77)*

> I was very meticulous about my body. I was very interested in my grooming. I still try to do it. I go, I come, I get my grooming done, so I try to be neat. *(Participant, Fatma, 86)*

4.2.1.2 Independency: *I can't do it, I'll be stuck*

Apart from meeting their own needs, their physical abilities seem to decrease over time or due to negative experiences (such as falls). For both caregivers and elderly participants, the fear of walking/moving or difficulty in maintaining balance has the effect of limiting their range of movement in their daily lives.

> Fear of movement is their biggest problem, especially after a fall. *(Caregiver, Semih)*

> I fell and broke my shoulder. Now I have a prosthesis here. Since that day, I can't even walk to the guard box [because of living at the nursing home] because of fear. *(Participant, Perihan, 80)*

Participants who experienced this fear of falling and movement stated that they needed someone for their needs outside the home (such as shopping) and had to wait for their availability. For example, one participant emphasized that she takes her cellphone with her even when going to the bathroom because of this fear (Participant, Tülay, 89). Participants stated that they were in contact with their children, grandchildren or, if available, the staff at the apartment building. The participant expressed this situation as follows:

> Researcher: For example, when you don't have an apartment staff or when he has a job...
>
> Participant: I can't do it, I'll be stuck. I mean I can't do it.
>
> Researcher: I understand that in such a situation you wait for him to be available.
>
> Participant: Yes, now he is sick, and he is not available today. Otherwise, he would go to my market and buy what I need. *(Participant, Fatma, 86)*

Interestingly, one caregiver blamed herself for her mother's dependency with these words because she cannot find a solution:

> Everything... I communicated and got the people around her to meet her needs. I feel very guilty, actually. If she had done it herself, if she could have done it. *(Caregiver, Arzu)*

4.2.1.3 Connectedness: *I am very happy when I hear your voice*

It is seen by almost all of the participants that the relationships with the people they consider close in their families have a great impact on their positive outlook on life. When describing the times when they were happiest, most of them described these relationships through their children, grandchildren, siblings, neighbors, and so on. These statements are given below in the participants' own words.

> Now with children, grandchildren, I become a child when I play with them. My foot gets stuck on the chair to make them laugh. I say oh my God. They call me "clumsy grandpa". *(Participant, Besim, 85)*
>
> I am very happy with my sisters alone. *(Participant, Perihan, 80)*
>
> I have a grandchild from my daughter. I am happy with them. I spend my life with them. And I'm very happy. I have a lot of friends. I am with them. All my everything is my children, my dears, my grandchildren. I spend my time with them, thank God I am happy the most when I am with my children. *(Participant, Gamze, 77)*

It is notable that this relationship is also welcomed by the caregivers, when describing their favorite activities with the elderly person they care for, many of them said that they enjoy talking to the elderly person and listening to the stories.

> But we can have a conversation together. She tells me everything. I enjoy it. It's good. She tells me. *(Caregiver, Pınar)*
>
> Conversation. It is very sweet. I mean, I usually say that the old memories are always on her mind. She tells more about the old times. For example, if there are things that happen daily, I'll relay them. We share them, we talk. *(Caregiver, Aslı)*

The didactic aspect of these stories was also emphasized as follows:

> I love talking to old people, making jokes, talking to them. So you listen to the experiences and these experiences are very useful because history unfortunately repeats itself. Yes. When you listen, you get to know the society, you get to know the people. You get to know a certain segment. *(Caregiver, Semih)*

On the other hand, it is noteworthy that participants who do not have children/are far away/do not see them often or live alone see this loneliness as a need to be met. The fact that this situation was expressed as a pitiable situation in the interview with the couple draws attention to the important dimension of loneliness for this age group. For example;

> I can take care of myself after this age, but it is not wise to live alone after a certain age. In a word, loneliness is hard. *(Participant, İrem, 81)*

> Researcher: No, they are not single, they have lost their spouses.
>
> Participant: They are in a pitiable situation, right? *(Participant, Besim, 85)*

> Psychosocial rehabilitation. Because most of them need that too. I mean loneliness is their biggest problem. *(Caregiver, Semih)*

However, I also found that the effects of the pandemic on loneliness were significant, with almost all respondents (including those with close relationships with family) emphasizing in some way the emptiness and weakening of social relationships in their lives after the pandemic.

> [When asked about the pandemic process] But they were very bored during that period. I mean they were very bored when we were not there. Because we are their friends. I mean they don't have any other

> friends. We are their only friends. We are their friends who visit them regularly. *(Caregiver, Semih)*
>
> Before the pandemic, we had a group. We used to go out together. I had a group from tours. There was a neighbor group. I was going to societies. I was working. I mean, we were always meeting outside very well, but after this thing [the pandemic] we closed down. *(Participant, İrem, 81)*
>
> So they [the nursing home] didn't allow us. We couldn't accept anyone. We couldn't go either. For example, my friends, I have friends of fifty years. We used to meet them every month, but now we can't meet them at all. *(Participant, Perihan, 80)*
>
> After the pandemic, our life has changed a bit. We are more like house cats. *(Participant, Ayça, 77)*
>
> We liked to walk, go to a nice place, a tea garden. We used to do it a lot with my mom before the pandemic. I'm telling you, this pandemic ruined my mom. She was so full of life. Let's go downstairs. Let's go to a tea garden. With the pandemic, my mother couldn't go. My mother couldn't leave the house. *(Caregiver, Arzu)*

In this case, it is seen that the fact that the elderly live alone/are far away from their loved ones is not the only reason underlying the feeling of loneliness. Parallel to this, the words of the participant living in a nursing home while expressing a request of her friend are also important for the study.

> She asked me in the morning. She said, "I am very happy when I hear your voice. She said, "Please say good morning to me when you pass by my door." It makes you emotional. *(Participant, Perihan, 80)*

Although she lives in a nursing home with many people of her age, her loneliness in her room and the fact that a voice she hears directly affects her happiness.

4.2.1.4 Self-esteem: *If I make an effort, I could do that too*

The importance of self-confidence in this age group often comes to the fore when they talk about both their physical abilities and their technological abilities. They even express that they consider themselves sufficient at this point through the comparisons they make. For example, when asked how they were able to meet their needs outside the home, the oldest participant of the study responded in a sarcastic and condescending manner, once again demonstrating his level of competency.

> Researcher: How do you withdraw your money from the bank?
>
> Participant: Is it hard to withdraw it? [Laughs] Is it a job to withdraw money from an ATM? [...] There is nothing I can't do, my dear, I can do everything. *(Participant, Tuncay, 96)*

Similarly, other two participants when talking about not having difficulty walking or not difficulty in using a smartphone support this.

> Some of my neighbors and friends don't know how to turn it [smartphone] on. So there are others who are worse than me. *(Participant, Tülay, 89)*
>
> I see that people at my age can hardly walk. *(Participant, Seçil, 86)*

Many of them stated that they could use other features of technological devices (especially through the use of smartphones) if they wanted to, and that they had this self-confidence. For the things they can already do, they commented that they are good for their age.

> I learned. I am very diligent. I mean, I ask everyone a lot. If we go somewhere, I ask the kids/waiters next to me how to do it. Oh, now I use it perfectly. [...] In case I make a mistake. If I make an effort, I could do that too [ordering something by phone]. But I don't. I don't do it in case I make a mistake. [...] That's why I got the phone mixed up. I got the numbers mixed up. That's fine, isn't it? Isn't it good for my age, dear? *(Participant, Gamze, 77)*

> But I mean, if I was curious about the details, I would learn, but I didn't really wonder. There's nothing you can't learn. [...] I can't text, I can't do that video call, but I mean, if I wanted to, I could deal with it. [...] Laziness. Laziness, actually. You know, I need to learn how to send a message, I mean, I need to learn how to do something. But wait, I'll learn from now on. *(Participant, İrem, 81)*
>
> I could do it a little bit if I tried, but I don't do it either [looking at recipes on the phone]. I don't know, I mean, I think I don't want to look. *(Participant, Tülay, 89)*

However, whether caregivers have the same confidence in the abilities of the people they care for is another debate. Given what all caregivers said about this, the participant's mental abilities seem to be an important factor.

One caregiver stated that the person she cared for could learn such new technologies and that she was capable of learning.

> I mean, it's [using VCAs] not much of a challenge, really. She's got a pretty good mind. She can handle them. She remembers the past well. She tells me well what she listens to on TV, what she hears. There is no problem with memory. *(Caregiver, Pınar)*

Others expressed concern about the difficulties associated with their illnesses and expressed support for their abilities, referring to when they were healthier:

> [while talking about tracking her medicine routine] Because my mom is very smart. She's a very intelligent woman. But here are these difficulties of age. *(Caregiver, Arzu)*
>
> I mean, for a while she could really handle everything. She understood very well what was being said. If she was in those times, she would have done that [using VCAs]. *(Caregiver, Aslı)*

When talking about how the participants' conditions affected their perspective and their confidence in their ability to use technological products negatively, the participant giving professional care service expressed this as follows:

> I can't imagine that most of them will answer to what [the assistant] says. Maybe it could be. Maybe because I always see people with a certain [health] problem, I may be thinking like this. *(Caregiver, Semih)*

4.2.1.5 Open to learning: *I am curious for my age*

As a reflection of the elderly's self-esteem emphasized in the previous section, it was observed that they described themselves with adjectives such as open to learn/curious.

> I'm curious for my age. I'm curious about everything. *(Participant, İrem, 81)*
>
> I like trying new technological products a lot. I am very curious, but now my eyesight is like this [difficulty in seeing]. *(Participant, Perihan, 80)*
>
> I like cultured people very much. What I can learn from them, and I am seventy-seven years old and they learn a lot from me, but no matter what, I love to be with cultured people. *(Participant, Gamze, 77)*

At the same time, it is seen that participants use some technological tools and activities to satisfy their curiosity. Television (TV) in general differs in that it offers them content about most things they are curious about. Also quiz shows are the prominent content in TV:

> I love quiz shows. "Who Wants to Be a Millionaire?", I love those shows. I mean I don't want to spend my life in vain, I want to live life fully, I want to know everything about the world. *(Participant, Gamze, 77)*
>
> [Reason for watching quiz shows] I like it; I enjoy learning something. For example, I enjoy learning something I don't know. I still like learning a lot. *(Participant, Fatma, 86)*

> I use TV more. I'm curious. I'm very curious to learn, no matter what. Whether it's something I can use or not. But I want to learn. I always want to learn something new. *(Participant, Tuncay, 96)*

It is also essential that caregivers identify their care recipients' skills or problems with technological devices based on this motivation to learn.

> Researcher: I mean, I understand that he used to use it [smartphone] for talking and playing games.
>
> Participant: Yes. He didn't do messages or anything, he couldn't do them [sending messages, taking pictures]. He would make an effort to learn, but he couldn't do it. *(Caregiver, Arzu)*

> Researcher: So if we were to teach [using VCAs], how could we do?
>
> Participant: We could teach them [elderly] by showing, we could explain. Because she is actually curious to learn. She also used to love reading books. *(Caregiver, Pınar)*

4.2.1.6 Stay active: *I am physically sound and strong*

The participants touched upon the importance of an active life, physically and mentally, which is also seen as the source of being able to be self-sufficient. The participants talk about the sports activities they did in their youth (Participant, Tuncay, 96), the days when they took walks (Participant, Seçil, 86), and the days when they hosted many guests together and did not get tired (Participant, Perihan, 80). Looking at the reflections of these memories about an active past on their current daily lives, they mentioned that daily chores such as cleaning provide both an occupation and a movement:

> I've never done anything like that [ordering by phone]. I am physically sound and strong. Besides, this [cleaning] is a movement. That's all, let me go, let me come, it lets my mind open a little. *(Participant, Seçil, 86)*

Also, they strive to move daily like setting daily step goals (Participants: Perihan, 80; Fatma, 86) or they feel that they need to incorporate movement into their lives (Participant, Tuncay, 96). One of the participants showed her mentally and physically active life with these words:

> Participant: I can't walk because I suffer a lot from my knees, but I walk around the table at home. I try to take two thousand steps or something, just to keep moving. I'm trying to strengthen my knees.
>
> Researcher: How do you know that you take two thousand steps, for example?
>
> Participant: I'm counting forty steps. I walk around ten times each. Four times five [times in a day] is twenty. That's two thousand steps. I calculate, that's two thousand. *(Participant, Fatma, 86)*

In addition, one of the caregivers explained the motivation behind the exercise of the elderly as follows:

> Most of them want to be able to go to the bathroom. That's the first thing. That's because otherwise it creates a lot of neediness and discomfort. It can also cause diseases. That is why most of them want to be able to walk there to go to the toilet. They want to be able to sit and get up. *(Caregiver, Semih)*

Although the majority of the interviews emphasized being physically active, other activities that participants do to be healthy are also noteworthy. For example, one of the participants mentioned that she paid attention to her daily water consumption (Participant, Fatma, 86), while another mentioned that he played games to exercise his brain (Participant, Tuncay, 96). In the light of all this, some of the participants made very positive statements about life, while others made more negative statements emphasizing their aging. The examples include the perspectives clearly expressed by the participants:

> I love life so much, baby. I love life so much. *(Participant, Gamze, 77)*

> But I can be self-sufficient on my own. I can keep myself busy. *(Participant, İrem, 81)*
>
> I have so much to do. I deal with the girls [her sisters who have chronic illnesses like dementia] a lot. […] I am the one who has them treated. I have a lot of work. I am very tired. *(Participant, Perihan, 80)*
>
> I mean, I feel like an elephant. When elephants are about to die, they go to the elephant cemetery and wait for their death there. That's how I wait in my house. *(Participant, Tuncay, 96)*

However, the important point here is that even participants who made negative statements showed that they were open to learning, self-confident about what they could not do, and able to take care of their own affairs. The sentence that best summarizes this situation is as follows:

> I'm living with what I know and I'm dragging it out. I want to die now... Actually I'm not bored, I mean I'm not bored on my own. I don't need anything. I'm enough, I'm self-sufficient. Those who look at my appearance think I'm better. But I know myself. I'm no good at all. I'm holding on to things I can do. But thank God I'm trying to do it. I don't need anyone. *(Participant, Fatma, 86)*

4.2.2 The Elderly's Perspective on Technology

In order to understand the participants' perspectives on technology, firstly how they define technology, then the technological products in their lives, and their motivations for using them were included.

4.2.2.1 Technology Definition

Before addressing the participants' relationships with technological devices and their perspectives, it would be useful to briefly mention how the elderly define technology. When they think of technology, some of the technological products that come to their

minds are as follows: Washing machine, refrigerator, vacuum cleaner, tea machine, microwave oven (Participants: Tülay, 89; Perihan, 80; İrem, 81; Fatma, 86), and cellphone, TV, iPad (Participants: Ayça, 77; Gamze, 77).

> Since I don't do housework, I have nothing to do with technology. For example, a refrigerator is very necessary. A washing machine is very necessary. A vacuum cleaner is very important. *(Participant, Fatma, 86)*

On the other hand, unlike female, one of the two male participants in the study defined technology with advanced technological transportation vehicles such as airplanes and high-speed trains (Participant, Besim, 85), while the other expressed his curiosity about getting news from Mars and life on other planets (Participant, Tuncay, 96). Therefore, seeking the usefulness from the technology can be seen as one of the key factors that determine their relationship with the technology.

4.2.2.2 Technological tools used and their functions

In the previous section, the products mentioned by the participants as an answer to what comes to their mind when they think of "technology" were shared. However, their answers may not necessarily cover all technological products that they often use. For this reason, this section includes the products they utilize frequently. When I look at the technological products used by the participants, it is seen that *TV* is still in the first place (Participants: Gamze, 77; İrem, 81; Tülay, 89; Seçil, 86; Fatma, 86; Tuncay, 96; Ayça, 77; Besim, 85). One of the participants supported this with the following words: TV is indispensable (Participant, Tuncay, 96). In fact, in the interview with the couple, participants stated that one of the spouses had 3 TVs in total, one in the workroom, one in the living room, and one in the kitchen (Participant, Ayça, 77). By looking at TV usage habits, it is seen that elderly participants play it in the background while doing work (Participants: Ayça, 77;

Gamze, 77) and this was also supported by the caregivers (Caregivers: Aslı, Arzu). Also, it seems that elderly participants consume many different types of content like films/TV series/documentaries/quiz shows.

Participants then mentioned *smartphones* (only one of them, Fatma, is using a regular cellphone). When we look at the functions used, it is seen that they mostly prefer the most basic feature of the phone, which is the call function. In addition to using this call feature to contact their loved ones, they also use it to meet their needs nearby (butcher/market/greengrocer).

In addition to calling, they stated that they use messages with their loved ones, send them nice words/columns, use for online shopping, online banking, video call, social media to be informed about the activities of their relatives, and to look for recipes. However, it should be noted that social media use (Participants: Perihan, 80; Besim, 85) and features that require intensive internet use such as online transactions (like banking, shopping - Participant, Ayça, 77) are not used very often. In addition, one participant, referring to the internet in general, expressed his surprise at being able to access all kinds of content in different languages as a positive aspect (Participant, Tuncay, 96).

Interestingly, it is noteworthy that apart from cellphones, some participants in this age group have a *land phone* and use it actively. Usage habits and the fact that some of their friends only have land phones were cited as some of the reasons. However, the motivations for land phone use will be detailed in the next section, along with the situations that match the motivations of this age group to use technological products in general.

Two participants stated that they prefer *tablets* for playing games because the screen is larger than a phone, the buttons are easier to select, or they are easier to handle and use than a TV (Participants: Ayça, 77; Tuncay, 96). Lastly, considering the *radio*, a participant with eye problems stated that she preferred the radio to listen to

the news and meteorology (Participant, Fatma, 86), and another participant (Participant, Besim, 85) stated that he preferred the radio to listen to music. Also, in both participants' homes, the radio continued to play in the background during the interview, and when the participants were asked why, they stated that it was on all day.

4.2.2.3 Motivations (not) to use

In this section, participants' motivations for using or not using technological products will be discussed. Although some of the data may seem to be repetitive with the previous sections, this section will also emphasize dimensions beyond technology that will be associated with VCAs.

4.2.2.3.1 Staying in touch with the inner circle even the ones that belong to their memories

The interviews revealed that older participants have a close network of loved ones and people who can be there for them in times of need. Regarding the participants' motivations for use, it is seen that the primary purpose is to communicate with their loved ones in their daily routine. Talking on the phone, making video calls, and messaging with siblings/children/loved ones were frequently mentioned by the participants. Regarding making connections with loved ones, one participant (Participant, Tuncay, 96) also said that he used the tablet to access old memories, pictures and video recordings of his spouse who has passed away several years ago, which helps to fulfill his longing.

> There are recorded memories. We have a house in Sapanca. My wife and I have a very nice house there. It is a duplex. And a river runs in front of it. Sometimes I want to hear the murmur of that river. It is making a voiced recording. When the river is flowing, I also watch it.

> My wife and I are there too. I look at the pictures of ourselves. I am having fun just like that. *(Participant, Tuncay, 96)*

Additionally, the phone has an important place in communicating with their close environment for some of their needs. As mentioned in the features used in the previous section, it is seen that they are in regular communication with some people such as grocery store, greengrocer, butcher, the staff at the apartment building.

Similarly, participants stated that they can reach their acquaintances, the staff at the apartment building or important lines such as 112 (emergency service) to meet their urgent needs. At this point, the portability of the cellphone was emphasized:

> Researcher: And what do you find easy about this phone?
>
> Participant: Well, it can be carried wherever you want. For example, I go to the bathroom with it. So that I can call someone if I fall. *(Participant, Tülay, 89)*

4.2.2.3.2 Keeping the fun and seeking the partner

After basic needs, participants mentioned that they use it for entertainment-oriented activities or to relieve boredom such as listening to classical music on the radio, playing games, and watching many different types of programs on TV. Among them, however, the role of companion attributed to technological products is important especially for the TV. It was observed that for many participants, TV is at the center of their lives. This close relationship with TV expressed with these words:

> Researcher: Why is the TV always on like this?
>
> Participant: It becomes a friend. It's just a voice. *(Participant, Tülay, 89)*

> TV is my friend. I turn it on. It's a habit. It felt like no one was home [without TV]. It feels like there is. I talk to it. […] I mean, there is sound. It talks. It shows the good and shows the bad things. For

> example, I don't know, it is like a friend. I feel like you'd go a little crazy on your own. *(Participant, Seçil, 86)*

Although it was not mentioned by other participants, one of them mentioned her radio as follows when describing a similar role:

> Because it has sound, it feels like there is a friend, like there is a person at home, so I need it [the radio]. If I go somewhere, for example, I never turn off the radio. It continues playing. I leave it open. To make noise when I come back home again. *(Participant, Fatma, 86)*

Moreover, quiz competitions serve the purpose of learning and self-improvement. One participant stated that she found TV quiz programs enjoyable because she learns about different people.

> "Who Wants to Be a Millionaire?" I never miss that. I like it, I meet the people there. They talk about stuff; everyone talks about their lives. I keep myself busy with them. *(Participant, İrem, 81)*

Besides seeing it as a friend, staying up to date is one of the main motivations (Participants: Ayça, 77; Tuncay, 96; Gamze, 77), which can feed the self-esteem, as mentioned in the first section with following words:

> For example, [my daughter says] this happened on TV. I say "Oh, I know that". She says "Mom, how?" I say "My daughter, I watch TV. I can tell you what happened in the match, what's happening where". *(Participant, Gamze, 77)*

4.2.2.3.3 Keeping everything as it is if novelty is not useful

Another motivation worth discussing is that the participants mostly aimed to benefit from technological products and seek practicality, in line with the features they used. It is important that the participants first mentioned home appliances in their

definitions of technology because they considered them necessary, while the expectations of caregivers emphasize useful technological products by considering the features that they thought the elderly person could not do.

> "Well, the washing machine. But that's very important. [...] I mean, you can wash the dishes by hand. But laundry is not like that. It washes the curtains. It washes everything, my dear." *(Participant, İrem, 81)*
>
> I mean, if something is necessary, if I have to use it, I use it. *(Participant, İrem, 81)*

> Researcher: Why didn't you use it [computer]? Haven't you try it before?
>
> Participant: I haven't tried it. I don't know, I guess there is not much need. *(Participant, Tülay, 89)*

> I mean, I open what I need, I don't tamper with it. *(Participant, Seçil, 86)*
>
> These cellphones aren't for them. It's too complicated. What do old style phones have? There's a talk program. Even those are not supposed to be that detailed. They just talk. There will be a talk button. There's only an on/off button. The rest is too much. *(Caregiver, Arzu)*

In the interview with the couple, while the wife criticizes how her husband use his cellphone, her main motivation to use cellphones is usefulness, as described with these words:

> I mean, he looks at everything. I tell him that he reads the phone for hours. You leave the book and read the phone. But it is not effective. He gets a note from his friend, a picture. He looks at them. I'm just, you know, task-oriented. *(Participant, Ayça, 77)*

How this participant uses technology to her advantage can be exemplified as follows:

> It doesn't work when I call out. I can't go to him because of my knee, so I make a phone call. The children call me on the phone. They say that if you are far away, let's call the father from his phone. *(Participant, Ayça, 77)*

Furthermore, the same participant stated that by learning some online transactions, she made her life easier and her dependency to her children has decreased. Ease of use also triggered this motivation in a positive way.

> I begged the kids for a long time to order me this [something in an online market]. I begged and begged, but it was in vain. [...] I'd say at least five or six years. My specialization [in using smartphones] might be in recent years. [...] As I said, it's easy. I was giving the kids a hard time for nothing. *(Participant, Ayça, 77)*

However, based on the information provided in the previous section, it is also remarkable that when ease of use is not provided, users choose to protect their habit, or they use only the basic features or completely give up using the devices. As seen in the examples above, feeling the necessity/obligation is a breaking point in their communication with the new technological products or their features. When these conditions are not met, it is seen that participants continue their habits.

> Because it's an activity they're used to, it's something they know, and they spend time doing it. Okay, I mean, instead of poking around and learning about these things, he'll go and do that. […] Because they don't have any plans for the future anymore. That's the main thing. If you have a plan for the future, you want to improve yourself, you want to use something. What will it provide them to use this? For example, he [elderly] wants to call his aunt's daughter whom he hasn't seen for a month. He won't see her for another month, but not use this. *(Caregiver, Semih)*

> What I know comes easy to me. Something I know comes easy to me. We are distant to what we do not know. *(Participant, Ayça, 77)*

It is thought that one of the important motivations behind the continued active use of land phones, mentioned in the previous section, is to protect this pre-existing familiarity. Design problems of smartphones, such as the complexity of the interface or some physical problems (sound is not heard everywhere), also favor the retention of this habit. One of the participants stated that she took her smartphone everywhere because she turned off her land phone (Participant, İrem, 81). Another participant explained how important her land phone was for her as follows:

> Everyone had it turned off, but it is the furniture in my house. I cannot turn that phone off. […] I like using it. I call the grocery store with it for example. […] Since I have the phone number memorized, I just dial their numbers. I call them from that phone to talk to my cousin or something. In other words, if someone has a phone at home, I always call them from their home. […] I like the land phone more. The smartphone seems more exhaustive/detailed for me. *(Participant, Fatma, 86)*

As seen in the smartphone example, the smartphone seems complicated, difficult to use and detailed to the participants. In particular, it was mentioned that touch interfaces are not easy to use for this age group and examples were given of difficulties such as touching the screen while speaking or accidentally pressing the buttons. This also creates a new dependency. For example, one of the caregivers said that the person she cared for could use the dishwasher because it had buttons, but not the washing machine because it was touchscreen and she had to wait for her to come and start it (Caregiver, Pınar). The caregivers also accepted this situation and stated that it was complicated for the person they were caring for and expressed their suggestions for this as follows:

> These phones [smartphones] are not for them. It is very complicated. What do old style phones have? There is a talk program. Even those are not supposed to be that detailed. They just talk. There will be a speak button. There's only an on/off button. The rest is too much. You know how to turn up the volume, it will turn up by itself. If the volume is turned down, you know how they hold the phones here and the

> volume is turned down. The phone should automatically raise the volume. The phone should know when to raise the volume. But there shan't be too many buttons. *(Caregiver, Arzu)*

At the same time, during the interviews, the caregivers also provided their own solutions on how they deal with these problems. When we look at these solution recommendations, it is noteworthy that caregivers are usually helped by color codes or icons. For example, one participant mentioned that she marked the washing program for whites with blue nail polish and the washing program for colored clothes with red nail polish on the washing machine (Caregiver, Pınar). Another participant mentioned that she put adhesive icons on the remote control to turn the sound on/off and on the frequently used programs on the washing machine (Caregiver, Arzu) (Figure 4.3). When we look at the usage habits of the elderly, it is seen that they compensate for these problems with large fonts and lighted push-button phones (Caregiver, Semih).

Figure 4.3 Sticker examples

4.2.2.3.4 Being protected from strangers

Another issue is security concerns. Two participants brought their problems related to it. One of them stated that people she did not know called her on her land phone, so she sometimes left it on to prevent it from ringing again and reaching her (Participant, Fatma, 86). A caregiver stated that she no longer leaves her phone at home because she thinks that the person she cares for can be easily deceived by strangers who call her on the phone because she believes everything they say, and that if her mother is going to call someone, she is the intermediary in this regard (Caregiver, Aslı).

4.2.2.3.5 Being protected from unfamiliar abilities of the technological products

In this section, the reliability of technological products is emphasized. One of the underlying reasons for questioning reliability is that the products do not fit into their logic and that they keep their distance from things that they cannot comprehend. One participant expressed himself as follows:

> So that device [computer] is looming large. So there is no logic. I mean I can't do it. I kept myself away. I have always stayed away like this. *(Participant, Besim, 85)*

Similarly, one caregiver stated that the participants write down the numbers in a notebook rather than on the phone because they are not familiar with the product and its capabilities, but they are sure that the notebook would not be lost, and also they know how to keep/protect the information in the notebook (Caregiver, Semih). This situation also brings with it concerns such as participants being afraid of making mistakes, the system crashing/breaking down, and running out of battery. One of the participants stated that when she did not know much about the product, she was

afraid of making mistakes, breaking it, and sending her money to the wrong place (Participant, Ayça, 77). Although she learned that the system takes precautions to protect her (e.g. getting approval before each transaction), she stated that she still had concerns as follows:

> I was very distant from online banking transactions. What I feared the most is if I send the money to the wrong place, if my money is lost/zeroed. I resisted switching to a smartphone at first because of such concerns. I said I can't do it. [...] "Actually, maybe I'll download it [apps] too, but I don't want to get too involved and lock the system somewhere", we still had doubts. "Will I break it or lose my money?" You can't because it approves you in many stages. If you mess up somewhere, you don't approve and you walk away. No one can do anything with your money. *(Participant, Ayça, 77)*

In some cases, these concerns completely overshadowed motivation to use, with one participant stating that after making a significant mistake, she never took another photo:

> I published my son-in-law's birth certificate [in a social media platform as a post]. I did it by mistake and everyone saw the birth certificate. They said, "Mom, what did you do?". It can happen, it's only human nature. I mean, I made those mistakes, yes I did. After that, I didn't take any photos on my phone so that I wouldn't make another mistake again. *(Participant, Gamze, 77)*

4.2.3 The Elderly's Perception of VCAs

Under this section, the reactions of the participants were mentioned after the products were introduced with the videos featuring Google's Nest Hub Max and Amazon's Alexa Together. When the answers given at this point are analyzed, the four different categories were identified specifically about VCAs (not encompassing all diverse technologies as aforementioned in the preceding section 4.2.2), which are (1)

Companionship, (2) Concerns about Losing Competence, (3) Skepticism about Usefulness, and (4) Limitedness to Talking. These will be explained in order.

4.2.3.1 Companionship: *It is like a friend*

The majority of the participants stated that they see VCAs as friends because they could communicate with them by voice and video.

> Researcher: And did you like this kind of voice communication?
> Participant: Of course I did. It's like talking to someone, like a friend.
> Researcher: What made you feel like a friend?
> Participant: I liked that it comes with a screen. I mean, if I could use it, I would buy it. No one shows me anything like that. *(Participant, Tülay, 89)*

Similarly, one of the participants stated that he could use it to meet his daughter and granddaughter, as he had no one left to talk to and share old family stories with (Participant, Tuncay, 96). At the same time, it is also important that this assistant can take on the role of the TV and be a conversation partner.

Other participants also shared some of their positive views about feeling not alone or feeling connected to their loved ones. For example, the video of the granddaughter and grandmother making a video call evoked the possibility that the participant living in the nursing home could communicate with her sisters without having to go downstairs. In support of this, during the interview with the couple, they made an analogy such as "we have each other, this is for people who live more alone/isolated" (Participant, Ayça, 77). Caregivers stated that they can communicate with this product, especially when they are far away. One of the caregivers, who is currently watching her mother with a remote camera, emphasized that thanks to this product, perhaps she could even chat with her mother remotely (Caregiver, Aslı). Another caregiver participant stated that the product could perhaps be a conversation partner for her patient with dementia, and that the speech ability of the product is very

important, especially for such patients not to forget how to make sentences and words.

> It would be a great thing to have voice interaction. Because I know that people who are alone at home are very affected by such voice interactions, especially patients with dementia, Alzheimer's patients. They need someone to talk to them. Here it can be their conversation partner. *(Caregiver, Arzu)*

4.2.3.2 Concerns about Losing Competence: *"I am still functional, I don't need it"*

Although many of the participants liked the product as a first reaction, they stated that they did not need it for the existing features because they were able to do their own work as mentioned earlier in the self-sufficiency section (4.2.1.1). At the same time, they mentioned that this product might appeal to sicker, bedridden people, but they were afraid that it might make physically fit people become lazy, and emphasized that the elderly need to be active.

> If you get very sick, if you become a cripple and cannot get up, then you can use it [VCA]. *(Participant, Seçil, 86)*
>
> It will make people not move. They will play with this. That's not good either. I mean, if you don't move in a house, what are you going to do? You just sit there and use it. *(Participant, Seçil, 86)*
>
> Let the elderly do some of the work by themselves. I do my own work. *(Participant, Tuncay, 96)*

4.2.3.3 Skepticism about Usefulness: *I use what I know, these are luxury*

The expectation of usefulness, which was previously mentioned in relation to elderly participants' views on technology, was also found to affect their perspective on VCA. For this reason, it has been observed that elderly participants tend to incorporate a technology or product into their lives if it is useful, otherwise they

prefer to maintain their existing habits. In relation to this, participants stated the following:

> I'm used to my phone now, my dear, it's [VCA] definitely more beautiful. New things definitely show more advanced things, but now I'm used to it, I'm using this. *(Participant, Gamze, 77)*

> Participant: Just hearing a voice is enough for us right now. These are for the people who have used all kinds of technology. You know, for the people who have devoured it. I mean, it seemed like a very, very high level to me.
>
> Researcher: Why? What exactly sounded like a high level? Because there is basically only communication here.
>
> Participant: I didn't see a benefit like this. I mean, I will say open and close, there is something to open it with my hand. So we have buttons. We have remote controls. I don't know. *(Participant, Ayça, 77)*

Similarly, although another elderly participant stated that she was open to innovations and that these technological innovations were better, she defined this product and what it can do as a luxury for people in her age group (Participant, Gamze, 77).

Apart from them, one caregiver criticized the use of voice communication in general, as it appeals to a small audience and is unfamiliar to them. For this reason, it was stated that they would not be motivated to learn it and that they would continue to use what they know.

> Participant: [VCA] Not a very functional product that will appeal to a small audience. For the elderly who have the authority to speak clearly.
>
> Researcher: Is it easier for others to actually push a button?
>
> Participant: It is easier. It's an interaction they are used to. A way of use that they can reach. They don't have to struggle with it anymore.

> Because it's a way that they won't bother to learn something after the age of 80. *(Caregiver, Semih)*

4.2.3.4 Limitedness to Talking: *What good is it if it provides the recipe but does not cook?*

Unlike the others, it is seen here that for some of the participants, the desired technological product is more than a voice assistant. Here, there is also a relationship with the participant's perspective on life. For example, one of the participants, who felt inadequate in many areas and received support for her basic needs, stated that she expected the product not only to give her a recipe, but also to make the food itself or to massage her for her pain.

> Researcher: So it can do so many things. You can say to it play me some music. Or you can say, show me the recipe for Turkish meatballs.
>
> Participant: What good is it if it provides the recipe but does not cook? That is where the issue is. For example, I can't peel a potato, I can't chop an onion. This one will do it, but you will prepare it. It will do it. *(Participant, Fatma, 86)*

With similar concerns, two caregivers (Caregiver Aslı and Pınar) also expressed that they would rather think of a robot or a real person for their caretaker. The caregiver Aslı emphasized another important point for the patient who moves in a wheelchair, stating that there should be someone with whom she can communicate with. She also stated that the underlying reason for wanting a real person was her fear of the product breaking down and that she could not trust it. The relevant quotations are as follows:

> Participant: Robot can't take care of my mom. Imagine if the robot breaks down.
>
> Researcher: What could happen if it breaks down?
>
> Participant: I don't know, anything can happen. It is a machine anyway. [...] Now, being a human-like robot is one thing, but at a very

> simple level, the robot can't do much anyway. So it has to be in a form that I can communicate with. *(Caregiver, Aslı)*

Similarly, another participant suggested using more human-like features in the design of a humanoid robot to make it friendlier.

> When it is humanoid, it will look sincerer to him. It's not in the shape of a ball or a glass. It will chat, talk. It will be different. It's like the patient with Alzheimer's I mentioned earlier who makes friends with the talking teddy bear he finds. Maybe that's how he'll relate to it. We need a robot that is calm, because humans are not calm. *(Caregiver, Arzu)*

At the same time, these humanoid features were also associated with emotional dimensions, which will be discussed again in the patient product expectations. (see Section 4.2.4.2)

4.2.4 Potentials of VCAs

On the basis of the information provided so far, some of the features that can create positive experiences in the lives of the participants have been mentioned. Before moving on to the positive values, however, the participants' comments on the usability of VCAs, mostly from a pragmatic point of view, are briefly included as they will also be important for design decisions. Then, usage scenarios of VCAs that can play an important role in the daily life practices of the elderly are included.

4.2.4.1 What Do They Want? A Look at User Desires in Voice Interaction Design

In this section, recommendations that could increase the usability based on participants' experiences are also included. First, voice is seen as an important

mediator in the elderly's interactions with technology. Examples include convenience, being able to do it while doing something else, being more practical to use in sudden situations, or enabling the voice to attribute other roles (such as companionship) to the technological product. Therefore, voice communication is thought to provide practicality for most of the participants. However, it is also thought that for some caregivers, voice communication alone may not be sufficient or voice communication may address a limited audience (Caregiver, Semih). For example, in one interview, a caregiver participant mentioned that her mother, who has comprehension difficulties, communicates via written communication and that she can only follow TV programs with subtitles (Caregiver, Aslı). In addition, having something in a written form can trigger feelings of trust as it gives them a sense that it will be more permanent and is a more familiar way of use (Caregivers: Semih and Arzu; Elderly participant, Ayça, 77). At the same time, it was emphasized that writing is also important in teaching VCA to the elderly as it is more permanent for the elderly and can prevent some problems such as forgetfulness (Caregiver, Aslı). Therefore, the presence of a screen might be also important for this age group. Perhaps showing a message to be conveyed to the participant both audibly and in written form on the screen can positively affect their relationship with the product. Similarly, the positive aspects of being able to video chat with loved ones via the integration of a screen, such as reducing the feeling of longing or reinforcing the feeling of friendship, were also mentioned (Participant, Tülay, 89).

Second, as mentioned earlier, some caregivers (Caregivers: Pınar and Arzu) use visual codes such as using colors/icons/shortcuts to increase elderly's interaction with the products. Similarly, examples were given like using the buttons for some of its basic features, such as on/off switches, and some functions being converted into a numeric value (e.g. press 1 to turn on the lamp, press 2 to turn it off) (Caregiver, Semih). In addition, one elderly participant stated that although she knew the wording in the product [such as "Log in"], she did not know what it meant in that context, which led to confusion and made it difficult to use (Participant, Ayça, 77).

Alternatively, a caregiver said that when he interacts with a product he has an idea of where he might find what he is looking for and this increases his motivation to find a solution or even to continue using it, whereas an elderly user's lack of such familiarity can also create a barrier (Caregiver, Semih). Therefore, the icons/buttons or explanations used on them need to be clear and understandable for the elderly user.

Thirdly, it was emphasized by some participants that the product should also be portable if it is to play a role in emergencies, as the elderly use phones with a similar motivation (such as carrying the phone with them all the time because they are afraid of falling). It was also emphasized by a caregiver that it should be noticeable, i.e. not being static, in order to attract the attention of the elderly (Caregiver, Arzu). She exemplified this by saying that when she calls her mother and cannot reach her, the product should attract attention by jumping and giving a message such as "call your daughter". For reasons such as emergency needs, participants, especially caregivers, have seen that Alexa Together, which was developed specifically for the elderly and showed emergency scenarios in the video, received more positive reactions at first impression.

Lastly, as in the examples above, the same caregiver stated that these products should be tailor-made (if any, by taking into account the needs related to the chronic disease) and for this, it would be important to design and act together with the caregiver.

4.2.4.2 Providing More: Suggested Features for Voice Interaction

In this section, the use cases that will create meaning in the lives of the participants, even if they do not always indicate explicitly, are briefly grouped under 5 headings. These headings are as follows: (1) Get involved in routines, (2) Recall positive memories to bring value and pleasure, (3) Apart but still together, (4) Think outside of the home, and (5) "Patient" VCA.

Get involved in routines

Surprisingly, none of the participants in the study mentioned that they needed any support for taking medication, although medication reminder was thought to be an essential feature in this age group before the study. The reason for this is the emphasis on medication reminders in the promotional videos of technological products such as Alexa Together, specially prepared for the elderly, which was also used in the research. However, the routines and habits they emphasized when talking about the medication system are noteworthy. The examples below support this:

> I don't forget. As soon as I get up in the morning, I take my medication first thing. I try not to forget, that's how I manage. […] No, I don't forget them [medicines to be taken in the evening], I take them right before dinner. *(Participant, Fatma, 86)*

> No. I remember it myself. I get up in the morning and take blood pressure medication and diabetes medication. After that, I have one or two vitamins. I take them. *(Participant, Perihan, 80)*

At the same time, when the routines developed by the participants are examined, it is seen that the participants usually place the medicines in the box or somewhere nearby in the morning to prevent forgetting them during the day. Participants expressed the methods they developed as follows:

> Medicines, for example, I have a little box on the counter in the kitchen. When I have breakfast there, I take the thing first, I take a tranquilizer. I put it in the box. I put the other two on the counter. The ones I use are in the box and the ones I don't use are on the counter. *(Participant, İrem, 81)*

> Researcher: Well, for example, would it be meaningful to remind you about your medication?

> Participant: I remember. Especially here [the medicine box], I put it here in the morning. [Showing with finger] Morning, noon, evening, night. *(Participant, Tuncay, 96)*

Also, two caregivers (Caregivers: Arzu, Aslı) stated that they organize the medication of the people they care for in a way similar to the box system. One of the caregivers stated that she constantly kept track of her mother's medication and was able to count and track missing/excess medication with silent satisfaction/appreciation, which means that she appreciates her mother's taking her medicines regularly but she keeps her congratulations to herself (Caregiver, Arzu). In addition, it was observed that the number of medicines taken by the participants was also important in determining the need for medication tracking. At this point, it was stated that although the days are written on the box, as the number of medicines increases, the hours of the medicines should be followed in a certain order and that the box is sometimes incomplete here, causing the medication order to be disrupted:

> But if you take the morning medicine at nine o'clock, it will be taken four times a day, six hours apart. Since you took it at nine, you will take the second one at three if you put in six hours. This will be in your mind. This is not written anywhere. [...] Sometimes I miss it, for example, I say, "Oh, it's past the hour". *(Participant, Besim, 85)*

Therefore, the VCA can remind the person to put their medication in the box or suggest a strategy to keep track of their medicines instead of reminding them to take it.

Similarly, all of the participants reported that they regularly keep a shopping list. However, with the exception of one (Participant, Tuncay, 96), they don't keep these shopping lists for themselves, but they keep them to share with their relatives. Almost all participants mentioned that they needed someone else at some point in their lives for their grocery needs outside the home, or that someone else met these needs. This was also mentioned by the caregivers. The participant who provided

professional support to the elderly stated that people usually call them at any time and tell them what they need (such as “buy me a nightgown”, “buy me a diaper”) and that this situation is not only valid for the elderly living alone, but also for husband whose wife is bedridden and cannot leave the house to not leave his wife alone (Caregiver, Semih). Furthermore, in the Independency section (see Section 4.2.1.2), it was mentioned that one of the caregivers took on this role and felt guilty because she did all the tasks for her, so now she is dependent on her (Caregiver, Arzu). Therefore, for this age group, taking care of their own shopping needs can significantly reduce their dependence on others. That’s why keeping the shopping list via the assistant and making them shareable with their relatives such as their (grand)children, the market vendor near their house can be meaningful for the elderly. Also, some participants said that they call their acquaintances by phone and tell them about their instant grocery needs and ask them to purchase. During the interview, the sentence below was beautifully to-the-point, because the expression used by the participant was in the form of a voice command that could be directly adapted while designing an assistant:

> “Buy me 300 grams of walnuts.” *(Participant, Fatma, 86)*

Even though this was the opinion of a single participant, it is considered important that they expressed their wishes directly. If the VCA is designed in this way, it may be easier for this age group to understand such a sentence pattern, without saying “add to my cart” or “order me”.

In addition, it was mentioned that watching TV is central to the participants’ daily lives. While some of the participants stated that they watch something on TV, they also emphasized some of the drawbacks. For example, two caregivers (Caregivers: Semih, Aslı) mentioned that sometimes the person they were caring for could not turn it off or change the channel because the remote control was far away or

complicated and they had to wait for someone to do those. One caregiver even described this as “a device invading you” (Caregiver, Semih).

They also stated that they watch the channel they want if it is already on or if they know there is a program they like at that given moment. On the other hand, the participants considered it unnecessary to turn on/off the TV through an assistant and stated that there was no need for that. However, integration of VCA with frequently used devices in the home can be still seen as a positive value for the participants. Here it is important that this happens without harming their own competencies. They can turn off or change the channel at will with a voice command. At the same time, tracking the broadcast stream to access different types of content and the content they like, reminding this when the program starts and changing the channel if the participant wants to can be given as examples of use scenarios that will provide a positive experience.

It is remarkable that the participants, including those who defined themselves as very dependent (Participants: Fatma, 86; Tülay, 89), tried to keep themselves and their bodies active, based on ideas like maintaining competence and not losing control. Especially for this, a participant’s self-established routine can create an important potential space for VCA. An elderly participant described her routine as follows:

> Participant: I can’t walk because I suffer a lot from my knees, but I walk around the table at home. I try to take two thousand steps or something, just to keep moving. I try to strengthen my knees.
>
> Researcher: How do you know that you take two thousand steps, for example?
>
> Participant: I’m counting forty steps. I walk around ten times each. Four times five [times in a day] is twenty. That’s two thousand steps. I calculate, that’s two thousand. *(Participant, Fatma, 86)*

For this reason, it was also discussed in the section on their perspectives on their lives that many of the participants wanted to move, they wanted to walk, and they

did so in order to feel competent. Thus, usage scenarios such as keeping daily steps they take or showing some physical movements with video narration would be interesting for them. In relation to this, the fact that the participant who follows the start of the hour with a radio reminder drinks a glass of water at every hour, and that the other participants keep water with them at all times in order not to forget to drink water, also prepares the ground for a positive experience suitable for daily water intake tracking. Therefore, in order to ensure the continuity of these behaviors, celebrating their successes, recording them, and even sharing them, if desired, can be used as a driving force to reinforce these positive behaviors. The reason is that during the interviews, it was noticed that elderly participants compared themselves with people in their age group for some of their characteristics. Examples of such comparisons could be "people at my age can't even walk" (Participant, Seçil, 86) when talking about walking, or "there are worse people than me" (Participant, Tülay, 89) when talking about friends who still use land phones. This comparison among themselves can sometimes be used as a driving force by sharing their own competencies to motivate each other.

It was also stated by the participants themselves that integrating VCAs to household products (such as washing machines, dishwashers) can also create a positive experience in reducing their dependence on others for utility purposes in addition to their communication with technological products for pleasure.

In addition to household products, VCA's compatibility with the participants' phones may also be important for this age group. Most of the participants stated that they often have problems with not being able to open the pictures that come to their phones, so they get support from caregivers. However, due to the high value they place on looking at pictures from their loved ones, participants try to compensate for this in some way. For example, the participant who cannot use a smartphone requests from her loved ones that they have the number of her caregiver, and any photo meant to be sent to her on important days, should be sent to the caregiver instead

(Participant, Fatma, 86). She also stated that while listening to the weather forecast, she was also curious about the provinces where her siblings live and the weather conditions there.

Finally, the routine shared by the same participant mentioned above (Participant, Fatma, 86) on how she meets her need for relatedness can play an important role in making sense of her daily life practices.

However, before concluding on routines, it is important that when engaging the elderly, it will be important to avoid notifications and reminders that may cause fear or sudden startle in this age group, especially those living alone. This excerpt exemplifies this need:

> Researcher: For example, would you like the TV to talk to you?
>
> Participant: I would, but maybe I would be scared.
>
> Researcher: Why would you be scared?
>
> Participant: What if it speaks against my will? Would it talk? Would something like that happen? *(Participant, Tuncay, 96)*

Recall positive memories to bring value and pleasure

During the interviews and while watching the videos on voice assistants, both the elderly and caregivers (Participants: Tülay, 89; Seçil, 86; Ayça, 77; Besim, 85 and Caregivers: Pınar, Aslı) mentioned that looking at photographs and video calls would be of great interest to them. These examples can be expanded with the appreciation of the idea of the digital frame or the fulfillment of longing through video calls. It seems that this can be an area that increase their relatedness through design solutions. Related to this, it is noteworthy that the elderly mentioned the past when talking about their happiest moments, shared a memory that came to their minds during the interview, or that some photographs had meaning for them. As mentioned above (see Section 4.2.1.3), talking about nostalgia was described as an enjoyable activity for

both the caregiver and the caretaker. It is important that one participant said that "if we are with her, she always shares her memories with us" (Caregiver, Aslı), which is important because this can be related to them feeling valued. At the same time, it is seen that this sense of the past is mostly maintained through photography. Apart from one participant (Participant, Tuncay, 96) that mentioned that he watches videos about beautiful memories with his deceased wife and so refreshes those memories, others prefer photography. In addition, this participant (Participant, Tuncay, 96) mentioned that when he eats, he opens the picture of his deceased wife on his phone and does activities with her. Also caregiver Aslı mentioned that she created person-specific albums for the caretaker and that caretaker looks at them from time to time. This would also play a role in suppressing their feelings of loneliness and longing. Therefore, it may be appropriate to consider the effects of the screen/visual on this age group when making design decisions. From this point of view, preparing special albums for different people (kids, spouse/wife, grandchildren) or important events (like travel memories) through a smart assistant, and accessing them at any time with a simple voice command can be important. Also, the chance to tell the memory that comes to their mind about the picture to the smart assistant, or to convey it to their loved ones/people they see close to them, and to know know that their experiences are still important can give new hope for life. An opinion supporting this is given as follows:

> I threw all the pictures in the garbage. I tore up all the old childhood pictures, all the pictures of youth. I said, after I die, they will be lying around like this. I'd better put them in their place so that they will disappear. *(Participant, Fatma, 86)*

Therefore, strengthening and sharing the connection with the past through technology can create a meaningful value in their lives in terms of the importance of these pictures/memories not only for themselves but also for their loved ones, making them feel valuable and never forgotten.

At the same time, the connection with the past is not limited to loved ones. One of the caregivers put it this way: “We talk most about their youth, their old habits, when they were good, when they could take care of their own needs” (Caregiver, Semih). In this way, having photos or videos of themselves can also provide an opportunity to revive their memories, to rediscover their own abilities. During the interviews, almost all the elderly women participants mentioned that they had been involved in sewing and embroidery in the past, but could no longer do it. Photographing their own memories and handicrafts, if any, can be useful to remind them of their self-sufficiency later on. Memories of the distant past, as well as activities and videos/photographs (e.g. while acting out a movement or playing a game) when they are with their family/caregiver, can also motivate them to stay vigorous and active in the short term. In relation to this, one of the participants providing professional care services mentioned that some of the incoming patients were motivated to go to their summer houses as follows:

> Most of them, if they are going to their summer houses, they want to be prepared for it. So they say that when I go to the summer house I want to walk. We help them go to the summer house in a fit way. *(Caregiver, Semih)*

Based on this example, a photo of their summer vacation the previous year might give them new purpose the following year to keep themselves active.

Apart but still together

Considering the daily lives of the elderly, it was observed that they spent most of their time at home, and one participant (Participant, Ayça, 77) even described themselves as house cats, adding the impact of the pandemic to this situation. For this reason, many of the participants are in search of a place where they can spend time at home and have fun. As mentioned in the previous sections, participants often

experience the lack of a friend in their lives. One of the participants who lives alone exemplified this situation by saying that he would only feel the lack of friends in his life, and other than that, he could do all his own work (Participant, Tuncay, 96). The role of VCAs as companions has been mentioned many times already, as described in the systematic literature review (see Section 3). It would be appropriate to be a playmate for the participants, but taking into account the illnesses of the participants is significant. For example, caregiver Arzu mentioned that word games and Sudoku had a mind-exercising effect for her Alzheimer's patient, and thereof they got a playmate to play games with her. In addition, as indicated in their perspectives on life (see 4.2.1), some of the participants (Participants: Gamze, 77; İrem, 81; Fatma, 86) defined themselves as open to learning and shared that they enjoyed watching quiz shows in TV for this reason. Therefore, sharing interesting posts according to the individual's interests, sharing content that draws attention to the current events of the day, while feeding the motivation for learning and self-improvement, can also keep them up to date and increase their self-efficacy. One of the participants (Participant, Gamze, 77) stated that she enjoyed knowing the current events and emphasized her competence in this regard. Apart from these activities, there is also the potential to take the assistant's capabilities a few steps further and turn it into a more social device in order to fulfill the participants' needs for companionship. Looking at the values that the participants attribute to this relatedness, it is seen that they enjoy interacting with someone one-on-one. Moreover, when discussing the need for companionship, it was realized that living with someone or being in close relationships with their family is not the only criterion. Other dynamics affecting the participant's life and social relations, such as other reasons affecting these relationships (living in a nursing home) and the effects of the pandemic, stand out. For example, it was stated that the need to have a talk is the reason behind the fact that elderly people call caregivers day and night. They see them as a friend who visits them regularly, and they communicate with their caregivers even though this

prevents caregivers from doing some of their tasks. One of the caregiver expressed his relationship with the elderly as follows:

> We have a very close relationship with most of them. Because most of them don't even see their own children for an hour every day, six days a week, but they see us. We are now like their children or their grandchildren, and there is a friendship between us rather than a hierarchical relationship. So they gossip with us, they have fun with us. They call us, they tell us about anything. *(Caregiver, Semih)*

Also, as mentioned in Connectedness section (see in 4.2.1.3), needing someone to say good morning in the morning (Participant, Perihan, 80) or leaving the radio on that there would be sound when she returned home (Participant, Fatma, 86) draw attention. They create an example of the type of communication and the role that the VCA can undertake according to the time and locations during the day.

Therefore, when considering the needs of the target user group, it is necessary not to act on the assumption that people around them already reduce their loneliness, but to evaluate all the moments they spend during the day at home or in their place of residence (such as a nursing home) from end to end. Alongside these greetings and small talks, considering the need for mutual interaction, establishing a network where elderly can instantly communicate with their age group or loved ones can create great value for them. For example, getting together with someone to play a game or have a conversation can prevent them from feeling that they are only talking to a product.

Think outside of the home

Interestingly, although almost all of the participants spent most of their time at home, they thought of scenarios outside the home after watching the videos. “So let’s say I’m on the street. We say, I’m on this street. Alexa will probably call the hospital numbers I gave her at that time, right?” (Participant, Besim, 85) or they used expressions such as “I like being able to monitor the house while I am out” (Participant, Tülay, 89). For this reason, it is noticeable that participants have some wishes such as monitoring the house when they are not at home or being able to carry the VCA with them. One participant’s unwillingness to do sports at home because he was afraid of dying at home without anyone’s knowledge can perhaps be prevented by remote monitoring of the house. In relation to this, the same participant also mentioned that before her wife passed away, he watched his bedridden wife at home with a camera and followed her when he was outside (Participant, Tuncay, 96). Similarly, a caregiver reported that she watched her mother with walking difficulties with a remote camera. However, she mentioned that they could not communicate through that camera and said that “with this product [VCA], I could communicate with my mother when I was outside, I could ask her to eat her food or ask her like “how are you?”, “are you bored?” and talk to her”. This was also mentioned by the participant who cares for her mother with Alzheimer’s disease (Caregiver, Arzu). Especially underlining the disease, she thought that such people only need a single command, otherwise they could do certain tasks, so she thought she could give that command with this product when she was out and make her mother eat and take her medicine without waiting for her to come back (Caregiver, Arzu).

“Patient” VCA

Different from the ones described previously, when looking at the voice assistant described by the two caregivers (Semih and Arzu), some personal characteristics

were seen to be attached to it, the most notable being its patience. In particular, caregivers emphasized the age-related characteristics of the elderly such as forgetting, asking again, and being stubborn. Another caregiver (Arzu) participant stated that she assumed many roles on behalf of the people she cared for, thus making them more dependent on her and that she was tired and unhappy. Considering the burden and distress on herself, she mentioned patience as one of the qualities she looks for in a VCA. From the perspective of the participants, the fact that the patience they seek is not shown to them from time to time creates some barriers in their relationship with technology. Thinking that they could do it if they were taught or complaining when they asked for help from their son (Participant, Tuncay, 96) emphasizes that the elderly also want more tolerance. As mentioned earlier, their self-confidence in what they can do if they want to/if they are taught can create a potential in this sense. Thus, taking an active role in teaching and promoting the product's own features will help the elderly to benefit from technology while reducing their dependence on others. For this reason, the attitude of the product to errors, explaining the use more than once, perhaps explaining/describing the use of the product in practice for this age group can improve this experience. For example, the caregivers mentioned that the fact that the participants did not know how to go back from the mistake they made triggered many negative thoughts such as "what if I lock the system", "what if I break it", and offered the suggestion of going back from such mistakes and easily exiting the page they entered. Especially considering the declining mental health related to age, it may be important to remind them and provide shortcuts that will help them remember along with teaching them. One participant emphasized that the app itself guided her and that she did not feel the need for her children:

> My son had prepared a note for me by writing these. I kept it, but it was in vain. Everything is visible in the app itself. *(Participant, Ayça, 77)*

It is also thought that the VCA can increase “patience” by being as clear as possible to the elderly and explaining the rationale behind it. Understanding the features/capabilities of the product, as mentioned in their motivations of using technological products (see Section 4.2.2.3), will be a factor in their interactions with voice assistants, as with other technological products, so perhaps it would be good to emphasize what it does and how it does it, and what role it can play in their lives, rather than generically listing its features when first introducing it to the elderly.

Based on all these explanations, the fact that the participants state that they do not need any of them and that they consider themselves competent at that point is a point that should not be neglected when making design decisions. Without damaging the participant’s self-confidence and sense of self-sufficiency, it should be supported with positive messages within the routine they create, not as a stimulant, a reminder of a missing aspect. At the same time, in terms of relatedness, it is thought that turning into a social product that will enable the elderly to be together with their loved ones such as family and children online and strengthening their ties with their past will create positive values. In addition, integrating VCAs into out-of-home scenarios can play an effective role in increasing self-sufficiency while reducing the person’s dependence on others.

CHAPTER 5

CONCLUSION

This chapter explains the main results and insights from the research through first answering the research sub-questions. Type A questions will present the analyses from the systematic literature review and type B questions will present the findings from the empirical study. Later, the main research question will be answered by combining the results from both studies. In the end, recommendations for further research that are based on the overall results and limitations of the study will follow.

5.1 Revisited Research Questions

In this thesis, two studies were conducted to identify VCA domains that would provide meaning in the lives of the elderly. The first one was a systematic literature review of empirical studies involving the elderly and other actors (such as designers, health care providers or caregivers) in 6 databases and the hedonic aspects extracted from 37 studies. The second was an empirical study, in which semi-structured interviews were conducted with 13 participants, 9 participants aged 75+ and 4 caregivers, to focus on elderly values that can create a positive experience with VCAs. It is seen that certain values possessed by the elderly affect their expectations of technology in general and their perspectives on voice-based assistants.

Hereby, the research questions of the thesis are revisited, particularly by synthesizing and discussing the relevant research findings.

A.1. Which hedonic aspects arise in elderly users' experiences with VCAs?

Within the 37 studies, it is found that some positive and negative attitudes were formed in relation to the actual and/or anticipated interaction with voice assistants (Figure 5.1).

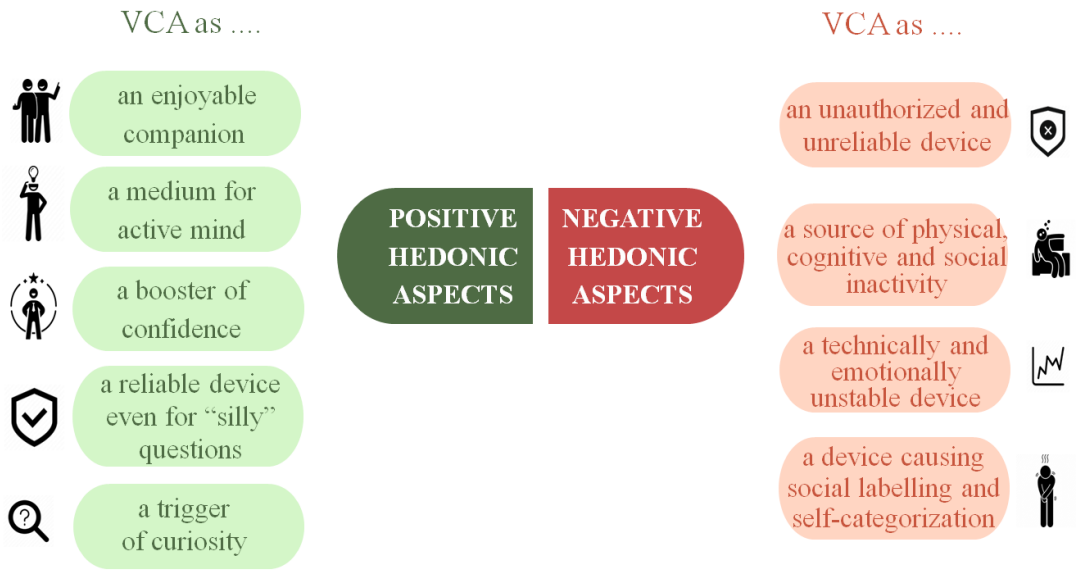

Figure 5.1 Hedonic aspects in elderly users' experiences with VCA

In terms of positive hedonic aspects, the VCA is perceived as an enjoyable companion, a mediator for mental well-being, a confidence booster, reliable even for silly questions, and a trigger for curiosity. On the other hand, negative attributes such as questioning this reliability, leading to social/physical/mental inactivity, being technically and emotionally unstable, and interacting with the voice assistant leading to self-categorization and social labeling were emphasized. More on these is explained in answers to the sub-questions.

a) What are the VCA features that impact elderly users' VCA experiences?

In the articles analyzed, as it was emphasized in Section 3.4.1.1, accessing different types of content (listening to music, video chat, games, watching videos), video interface (using different backgrounds), and storytelling (such as jokes, recipes) contributed to the perception of an enjoyable companion. On the other hand, while the positive messages strengthened this companion relationship, sometimes expressing these emotions too strongly, such as "I love you", was associated with being emotionally unstable (see Section 3.4.2.3). Thus, the content, style, and manner of the voice communication was also crucial apart from the functions provided. Furthermore, it is seen that the voice interface, interacting with others, presenting media content, and playing games to the participants helped to keep the brains of the elderly active (see Section 3.4.1.2). Also, in Section 3.4.1.4, the fact that the product could speak and provide instant answers to what they were curious about was seen to increase the participant's curiosity and encourage them to use the product - even for silly questions.

In addition to positive experiences, the fact that an agent who reminds elderly participants of things and tells them when and where to do what, has the effect of increasing their self-confidence in being able to use the product, and this increases their enthusiasm for other technological products beyond the VCA. However, the boundary needs to be well-defined here. Concerns about VCA taking over all the responsibilities of the elderly or the caregiver and reducing the physical, mental and even social skills of the elderly have been emphasized. In one study, participants even compared it to turning into a plant, emphasizing the value they place on being physically and mentally vigorous (Martin-Hammond et al., 2019). Similarly, the fact that interacting with the product made some participants feel as if they were foolish showed that how voice technologies should be included in the lives of this age group still needs to be discussed (see Section 3.4.2.4).

Although users feel safe when using voice communication because the assistant will at most misunderstand and stop and will not lead to unintended consequences, the

limited communication capacities of the products still cause usability problems and negatively affect the trust in the product. First of all, unauthorized voice recognition and the lack of a locking system were seen as security vulnerabilities and increased participants' concerns. In addition to these security concerns, being constantly in listening mode and sharing personal information also draw attention. The questioning of the timeliness and accuracy of the information provided, especially in the field of health, and the concern of accidental spending are emphasized. It was also mentioned that a product that speaks in the flow of daily life involuntarily disrupts that flow and causes fear in elderly participants (see Section in 3.4.2.1). In addition, VCA has been found to be unreliable in some studies for problems arising from technical features (such as internet/electricity outages) (see Section 3.4.2.3). Therefore, although there are features that affect positive experiences such as voice interaction and offering different content, there are usage and safety concerns in VCA design that may be of concern to the elderly.

A.2. What are the methodological considerations of investigating the elderly's interaction?

In the studies carried out with the elderly, many different points were underlined, from the preparation stage of the process to its execution. In the preparation phase, examples were given on supporting the participants during the installation of the product, if any, and preparing user manuals by including content that enabled them to interact with the product. In questionnaires, which is the most preferred method, the wording of the questions and the options should be simplified as much as possible so that the elderly can answer easily. It is seen that usage logs are mostly utilized if there is a product prototype in the study. However, relying only on usage logs is not considered sufficient. Although usage logs were used to prevent the problems that can arise from the participants' forgetfulness, using only usage log method may lead to a limited analysis because of the user being aware of recording. For this reason, usage logs could be a secondary research method as it is done in many studies. At

the same time, because of difficulty in including this age group; the inclusion of relatives/caregivers in studies can be seen as positive as it can provide a more reliable environment for the elderly and also give a chance to the researcher to see the communication between them. Although the inclusion of the elderly and the caregiver at the same time adds another barrier that needs to be overcome for the recruitment phase, studying with the relatives has potential to enrich the data to understand elderly's life closely and more objectively.

Furthermore, the possibility that different actors and even the elderly end-users themselves can improve the design and research process is emphasized through co-design/research processes (See Section 3.3).

Now the Group B questions, prepared for the Study II, will be answered.

B. Which elderly values should be considered when designing VCA interactions?

Personal values such as connectedness, self-sufficiency, self-esteem, and openness to learning are found to influence perspective on life and their interaction with technology as it was mentioned in Section 4.2.1 and 4.2.2. Therefore, values such as expecting benefit from technology, maintaining habits and seeking reliability appear. The details of these values will be answered in the sub-questions.

What are the values that shape the elderly's perspective on life?

As mentinoned in the *Elderly's Perspective on Life* (see Section 4.2.1) in detail, the elderly defined themselves with adjectives such as standing on their own feet, maintaining ties with their loved ones, improving themselves by constantly learning new things, being physically and mentally vigorous, and having high self-esteem. Therefore, while they were explaining how their perspectives on life were shaped by these attributes, the most prominent value for the elderly, especially in relation to the

competence component of the SDT, is seen to be the ability to meet their daily needs (such as meal preparation, and self-care needs). Participants who were able to meet their own needs then stated that they were afraid of losing that independence. Related to this is the fact that the elderly, especially those who are afraid of falling and cannot trust themselves outside alone, depend on acquaintances for their out-of-home needs (shopping needs being the most frequently mentioned), which negatively affects their perspective on live (see Section 4.2.1.1 and 4.2.1.2).

In relation to *competence*, it is noteworthy that participants have self-esteem on their physical abilities such as walking, being able to take care of their own needs, and being able to use technological products or even when they are currently not using, but believe that they would be able to. Caregivers also shared the same esteem towards elderly's capabilities. Realizing this self-perception of elderly is especially important in order to understand who this age group is and what they can accomplish. In short, design decisions that make good use of this self-esteem and support their belief in what they can do have the potential to increase the likelihood of positive experiences for this age group (see Section 4.2.1.4).

Another way in which they nurture this self-confidence and competence is through their efforts to stay strong and active physically and mentally. The more physically and mentally strong they felt, the more they described themselves with positive adjectives and expressions. Physical activities such as regular water consumption and walking and mental activities like games are activities that provide this effect (see Section 4.2.1.6).

Furthermore, curiosity is an important value that connects them to life. This age group talked about their curiosity to learn and discover new things and the activities in their daily lives that feed this curiosity. Following the daily news and watching quiz shows are some of the most common examples (see Section 4.2.1.5).

In relation to *relatedness*, another SDT component, being connected to loved ones is one of the most important values for this age group. Participants generally mentioned their close relationships with their loved ones such as their children and family when

talking about the happiest moments in their lives and explaining their attitudes towards life. For example, those who spend good time with their children and siblings and who are in close relationships with them talk about their appreciation of life, while those who feel lonely complain about this situation. Especially with the pandemic, they stated that they were more dependent on the home and activities carried out at home, and the need to interact with others became more visible (see Section 4.2.1.3).

What values do the elderly attribute to technology?

Before moving on to what values the elderly attribute to technology, it can be helpful to briefly present what they understand by technology and which technological devices they use and for what purposes.

It is observed that the elderly defined technology in terms of the most frequently used household appliances (such as refrigerators and washing machines) and then they thought of phones. Therefore, although a relationship of interest or expectation of benefit is usually established with technology, some participants defined technology in terms of things they were curious about beyond what they knew (such as life on other planets) (The details were shared in Section 4.2.2.1).

When the technological products they use are examined, TV becomes prominent because it offers more than one content, it provides companionship, and it makes them feel less lonely at home. TV is followed by cellphones and land phones. However, the use of both does not go usually beyond the basic features of calling someone. In the case of smartphones, although some users mentioned features such as social media usage and online banking, this does not reflect the general pattern. Finally, the use of tablets for playing games and radio for listening to news/music were mentioned (The details were shared in Section 4.2.2.2).

Based on the participants' motivations for use in Section 4.2.2.3, companionship, usefulness and reliability values attributed to technology prevail. When considering

the ones associated with companionship, it is seen that this age group is in close contact with their families/relatives and that they mostly communicate with them through calls or messages on their cellphones. Apart from this, it was expressed that the longing for the deceased spouse is being fulfilled with a video on the tablet or a photo on the phone. In addition to this connection, technological products are also used for entertainment purposes and a companionship role is attributed to them. One of the biggest underlying reasons for this is the sound of the television/radio, which makes these technological products seem more friendly than others. At the same time, it is also seen that activities such as playing games and watching quiz shows, which are also used for entertainment purposes, nurture values such as self-confidence and openness to learning, as emphasized in the elderly's perspective on life (see Section 4.2.1.4 and 4.2.1.5).

With regard to the expectation of usefulness from technology, habits of the elderly are one of the most important factors affecting their perspective on a new product/technology. Although the participants have positive attitudes towards newly emerging technological products at first sight, when the features they use or their thoughts are questioned, the tendency to use their basic features or to continue their existing habits (preferring land phone rather than cellphone) draws attention. It is stated that the most important factor determining this is ease of use. It was mentioned that some methods (such as color codes, making the buttons more prominent) are used to ensure the ease of use, if ensured, this will add positive value to their lives by reducing their dependence on others (e.g. their children) and meeting their own basic needs (such as starting the washing machine) (see Section 4.2.2.3.3).

Finally, their distrust of technological products also triggers their tendency to maintain their existing habits. While one of the reasons for distrust is a security concern because it is usually called by unknown numbers, another is reliability problems that arise from not knowing the product and its features well. These, as mentioned above, lead participants to use what they are used to or to abandon it altogether (The details were shared in Sections 4.2.2.3.4 and 4.2.2.3.5).

Which scenarios/use cases can be considered in VCA to provide positive user experience?

Participants' perspectives on VCAs were instructive for use cases that would create potential positive experiences for the elderly. Similar to the perspective on technology, under the heading of the perspective on VCA, it was mentioned aspects like: the attribution of a companion role through audio and visual communication, the fear of losing competence with the prospect of taking on all responsibilities, the questioning of its usefulness and the inability to go beyond the voice, especially for more dependent older people (The details were shared in Section 4.2.3).

As mentioned earlier in their perspectives on technology, many of the participants talked about the routines they have. Therefore, the first scenario that came to the forefront was to maintain the order created by the elderly and to be involved in their routines: reminding their medication routine rather than a simple alarm for the medicine time, reducing their dependency on others with a shareable shopping list, adapting to the other technological products/phone to help them with the features they feel inadequate for and showing them the potential options available. Transferring the value of products they already use to VCAs (including information about their loved ones in case of weather), reminding their physical activities or (if they do not have any) encouraging them to do them in order to stay vigorous are presented as examples of scenarios that can take place in their daily routines.

In the second use case, the participants' attachment to the past, their desire to recall and share memories with their loved ones, as well as recalling positive memories of themselves are use cases that will nurture the participant's competence and relatedness.

The third one includes use cases of companionship, which has been emphasized many times before. Accordingly, for the elderly who often spend time at home, being a playmate with a product that makes life at home more fun (in some cases even with games specialized for their illnesses), sharing the interesting agenda on social media with their friends, turning the VCA into a more social product that can help meet the

same age group remotely, sharing their successes with an another elderly, talking with them when and where they need (such as saying good morning to the elderly who lives in a nursing home when they wake up) presented under the *Apart but still together* sub-heading (see Section 4.2.4.2).

In the fourth scenario, cases of out-of-home use were evaluated. Participants mentioned the portability of this product for people who live alone, perhaps for their loved ones to monitor their home in case of emergencies, for caregivers with bedridden patients to communicate remotely, or for scenarios that take place completely outside the home (such as calling the previously given hospital number).

In the last scenario, differently from the others, it is underlined that VCAs should have some human characteristics such as being patient. Some of the decisions that could be implemented were mentioned, such as being tolerant of mistakes, repeating the same things more than once in case the elderly person forgets, being self-guiding (backtracking from an error, explaining how to use it completely, and clearly introducing its own features/system) (The details were shared in Section 4.2.4.2).

After answering all the sub-questions, the subsequent section answers the main research question by building on the previous answers.

5.2 Main Research Question: How can VCAs provide meaning beyond the pragmatic perspective in elderly users' daily life?

The results of both studies show that the elderly define themselves as self-sufficient, self-confident, curious and bonded to loved ones/relatives. Therefore, it is found that it would be important to integrate use cases that support these values into the VCA design. In the study conducted with the elderly and caregivers (Study II), the participants' emphasis on standing on their own feet and their attention to staying active overlapped with the concerns of declining physical, mental and social abilities in the systematic literature review (Study I). Thus, the priority of this age group is not to harm the areas in which they feel competent and autonomous. Regarding the

daily life practices through which the participants describe these areas, they mention that they meet their needs themselves and the routines they have. These routines were described through examples such as keeping track of their medications, keeping a shopping list, exercising to stay physically and mentally active, and drinking water. In this way, reminding them of their routines, rather than reminding them of a missed part of their lives, will support their sense of self-competence. It may be important to remind them of their previous medication regimen or to share their shopping list with their loved ones or people they often ask to take care of these needs.

With such suggestions, all the responsibilities of the elderly will not be taken away and tied to a technological product or VCA, and thus will not pose a new problem for their autonomy. In both studies following are emphasized as possible problematic points: being completely dependent on the product, taking the responsibilities of all the elderly. In the systematic literature review, even the caregivers were reflected as negative aspects. In the studies, being attached to such a technological product is attributed with strong negative labels such as looking foolish, not wanting to go down to that level. This can also be seen as a reason why they want to stay physically active, so offering physical movement suggestions and reminding them of their current living patterns can also help them to get involved in routines.

At the same time, the power of positive messages in interacting with older people presented in Study I can also be incorporated into these scenarios to support and celebrate movement in the lives of the elderly. In addition, it was emphasized that comparing themselves with others has an effect on feeling sufficient as underlined by SDT regarding *competence* (Ryan & Deci, 2017). It was also expressed by the elderly in Study II. Therefore, the fact that achievements can be shared with others, if desired, can be considered as another dimension that positively triggers the elderly and supports their feeling of competence.

Furthermore, the findings from the systematic literature review (Study I) suggest that beyond physical activity, their mental abilities can also be supported through games, media content and information sharing. In Study II, it was exemplified that some

positive scenarios can be created without making them feel managed by or dependent on a product. For example, a usage scenario that leaves the decision to the elderly, such as not changing the channel on the TV instead of the elderly, but asks whether they want to switch to this content that they like can spice up their ordinary life. However, at this point, it is important how these warnings are given, because in both studies, it was found that sudden notifications negatively interrupt the flow of the elderly's daily life and bring some negative emotions such as fear. Therefore, in Study I, it was suggested that a melody that did not startle the participants and a cue that the VCA would speak before the notifications might be good.

In order to incorporate VCA into the daily routines of the elderly, their perspective on technology needs to be taken into account along with their usage habits. As mentioned in the results of Study II, the fact that they find it easy to do what they know and expect benefits from technology will lay the groundwork to facilitate the provision of these requests through their routines. In addition, it is thought that their openness to learning and their curiosity about technological products will positively affect the inclusion of these new technologies in their lives. Especially in Study I, the fact that the product speaks is itself an element of curiosity for them. At the same time, increasing the interaction between the elderly and new technological products thanks to these interesting features has been found to support them to try other technological products and to think that they can also use them, and to support their self-confidence in this regard. This is also observed in the participants' own statements (see Section 3.4.1.3).

However, there is one value that the elderly want to be met from VCA technologies, which is reliability. The main reason for this is that the elderly do not know this product well, do not understand its capabilities and do not know the logic behind how it does what it does. Therefore, ensuring trust in the life of this age group was seen to be an important factor affecting their interaction with technological products. Basically, it is important to introduce the product to the elderly participants in the most basic and clearest way. The most common concerns about technology (such as the internet/electricity outage) were mentioned in both studies.

In the case of the VCA, it is noteworthy that in Study I, as a result of their actual experience with the VCA, the features such as gas/door open warnings in case of emergency or reminder features that provide reliability are evaluated positively. In addition, both studies highlighted features that need to be improved, with an emphasis on trustworthiness. In the case of VCA, the following points were mentioned: improving unauthorized voice interaction (preventing misuse by an unwanted person), strengthening the login password system, talking about the reliability of the data provided, especially in the field of health (providing credibility score, working with health care providers or completely private health assistant as suggested in Study I), providing privacy (solve problems about always listening feature, sudden/unauthorized inclusion in home life with video call, collecting personal information), preventing accidental financial expenses with voice (see Section 3.4.2.1). Therefore, although both studies mention positive aspects of voice interaction (e.g. strengthening feelings of friendship, practicality), the elderly still describe extreme feelings for voice interaction. For example, according to the findings presented at the end of Study I, there is a wide range of users, from those who say that voice interaction allows them to ask the silliest things -because they think that, in the worst case scenario, the voice assistant will not understand and will not be able to do them- to those who emphasize that the voice's practicality will lead them to spend money by mistake.

In addition to the expectation of reliability, it is important that especially caregivers expect a more patient technological product considering the slowing down/declining mental characteristics of this age group. In the findings of the Study II, it is suggested that the VCA should answer the same questions, repeat them, and even explain how to use the product itself when necessary, as the elderly ask the same questions again and again and forget how to use the product. At the same time, there is a need for a communication design that does not make the users feel guilty about the problems arising from the product's own usability and limited interaction capabilities, that exhibits a more tolerable behavior towards mistakes, and that shows how to recover from mistakes.

Apart from these, one of the most important points for this age group is to be in contact with the network they have created (their children, grandchildren, friends, someone close to them who takes care of their work, such as an apartment attendant/keeper). It is noteworthy that they define happiness in their lives through their relationships with their loved ones. For this reason, *relatedness* is also considered to be an important point in a VCA design for the elderly. As seen in both studies, it is observed that this age group's attachment to their loved ones/acquaintances affects their expectations from technology and their motivation to use the product and consume the content. First of all, it is seen that voice has a positive effect on this motivation in the participants' approach to technology. As mentioned earlier in Study II, a good example of this is when the TV/radio is turned on only for having sound in the background (see Section 4.2.2.2). For this reason, participants attributed a friendship/companion role to these products when leaving the house and feeling welcomed when they come back.

Based on the self-sufficiency value described earlier, the underlying reason for this is that the participants think that they can compensate for their other needs except for the feeling of companionship. Therefore, more specifically, it seems that older people seek a similar companionship role from VCAs. This is strongly supported by the results of both studies. In Study I, the participants' access to different types of content (e.g. music, games, video chat, screensaver, narrator features) with the VCA made them consider it as an enjoyable companion. Similarly, in Study II, participants reported that both the voice and video interface evoked a sense of companionship. Therefore, in Study II, it was found that participants valued the visual modality as much as the voice modality. The reason for this is that the participants want to keep in touch with their loved ones visually, and they follow important developments in their lives through photographs. At the same time, looking at photographs is one of the most prominent activities for this age group; it is a tool that connects them to their memories and reminds them of happy and good times. As emphasized in Study I, screen-based products help to reduce their sense of longing. Thus, apart from being connected to their loved ones, their attachment to their memories and their desire to

tell past stories create a new usage scenario for VCAs. In addition to being integrated into cellphones so that they can access photos sent by their loved ones without the help of anyone else, the VCA can also be customized according to this feature. As presented before, albums specially prepared for this age group for their loved ones, and the opportunity to tell their memories to the assistant and share them with their loved ones will create a chance to emphasize that they are important. At the same time, this can positively nurture self-sufficiency. It was noticed that when participants were reminiscing, they were not only talking about their past stories with others but also about their own good times, so creating an album of their own and showing videos of their favorite activities can be a new source of motivation in life and support them to keep themselves active.

Here it is necessary to mention some points to be considered in design. This age group perceives voice communication with a technological product as a threat to themselves and their abilities. Similarly, in Study I, the concern of looking foolish is mentioned. Therefore, it may help to reduce the concerns of this age group by making VCAs more social. The concern was also mentioned by the caregivers that the elderly interacting with only VCA could lead them to become socially inactive. Being able to instantly connect with their age group will make their time at home more enjoyable, while being in contact with someone and playing games will also be mentally good for this age group. In relation to mental wellbeing, some participants noted that the content that VCA can provide is also worth considering on a disease-specific basis, and that playing sentence-building games for the elderly with dementia, providing interesting information to keep their brains active, and stimulating their curiosity are also areas that can have positive effects. In the light of all these, a more sociable, more trustworthy and more patient VCA that is included in their daily routines will offer use cases that create meaning in their lives (Figures 5.2 and 5.3).

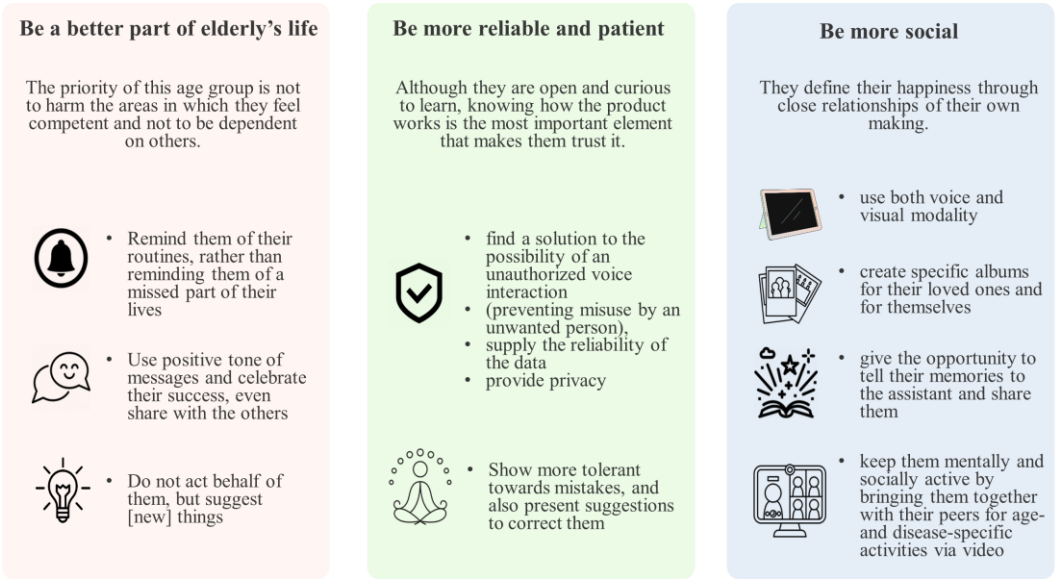

Figure 5.2 UX dimensions to provide meaning beyond the pragmatic perspective

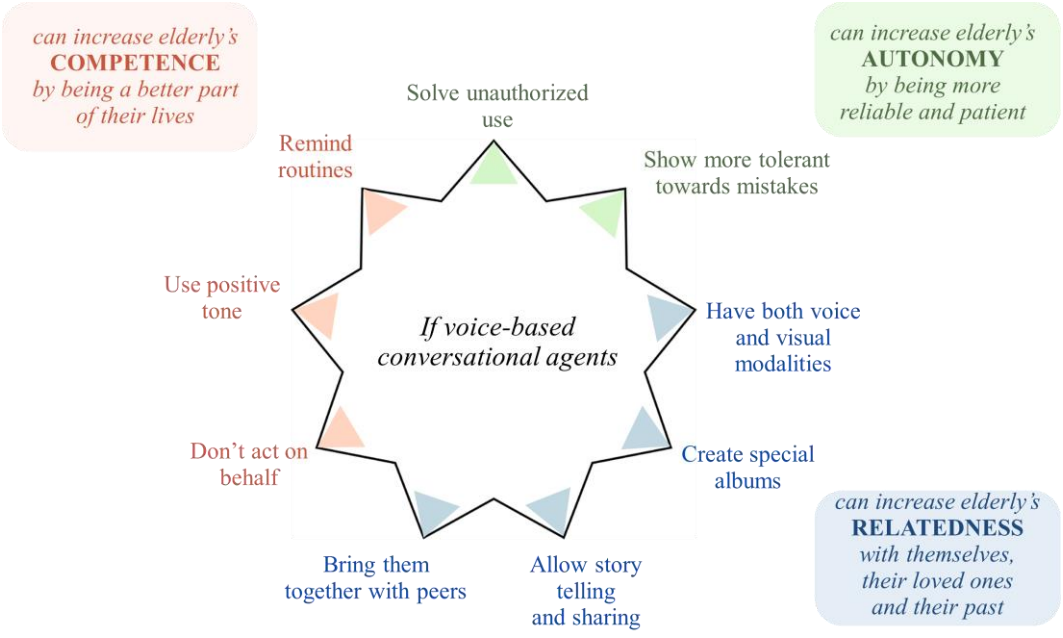

Figure 5.3 The relationship between UX dimensions of VCAs and SDT competents

5.3 Limitations of the Study

This thesis focused on the group of users aged 75 and over, as there are relatively few studies and access to this age group is difficult. However, there is a difference between age and how the elderly consider themselves as “old”. For this reason, the age range could be expanded, and the study could be reconstructed with the elderly with different profiles (living with grandchildren/family, having a health problem that affects their daily life etc.). In addition, the results of the study can be expanded with other actors in the lives of this age group (such as doctors, designers). Furthermore, other figures in the lives of the participants, even if they do not have the title of caregiver, can also be identified and included (such as an apartment attendant/keeper).

Moreover, the participants in this thesis were all above a certain level of socio-economic status and had smartphones (except one participant). In future research, considering people from different backgrounds and with different technological competence will increase the diversity of the results. Next, due to the lack of product support in Turkish language which could provide natural interaction to the participants, the study was evaluated through possible usage scenarios. In future studies, research can be conducted with a VCA that focuses on the positive value-added aspects mentioned in this thesis. Similarly, the extent that the positive value perceptions of current assistants overlap with the aspects mentioned in the study can be examined as well.

5.4 Suggestions for Future Research

Preparation in advance for the work to be carried out with the product, and in the case of VCA, explaining the commands and providing a printed manual against forgetfulness are among the steps that have been taken into consideration in previous studies. Although facilitative methodological steps specific to this age group were considered prior to empirical study (such as providing visual cards as stimuli,

preparing videos in Turkish language), some suggestions for future studies can be made. First of all, for this age group to participate in the study, it is necessary to have an intermediary person that they can trust, and sometimes this intermediary person must be present during the whole interview. Nevertheless, attention must be given that the intermediary person does not affect the participant's answers. It is also necessary for the intermediary to be previously informed about the subject matter. In addition, studies have suggested co-design stages with caregivers or people who know their needs well in order to personalize the product for the elderly with special diseases.

Secondly, in case the participant has visual impairment, making adjustable picture cards/images instantly (perhaps with the help of a technological product such as a tablet), keeping the number of visual elements low in order to prevent distraction and maintain the focus of the study, keeping the playback speed of the videos low in order to facilitate their understanding and contextualization of the events, and if possible, adding subtitles can be proposed to the future researches as suggestions to be taken into account for setting up methodology stage.

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APPENDICES

A. Keyword Pool

Search Terms For: VCA			
“agent”	“Conversational device”	“personal assistant”	“vocal”
“AI agent”	“Conversational humanoid”	“personal attendant”	“Voice activated app”
“alexa”	“Conversational interface”	“Personal Digital Assistant”	“Voice activated assistant”
“Amazon Alexa”	“Conversational Personal Assistant”	“relation* agent”	“Voice activated device”
“amazon echo”	“Conversational system”	“relational agent”	“Voice activated interface”
“animated character”	“conversational system*”	“relational agent*”	“Voice activated system”
“Artificial conversational entity”	“Conversational technology”	“Siri”	“Voice activated technology”
“Artificial intelligence chatbot”	“Conversational User Interface”	“smart speaker”	“Voice app”
“Artificially intelligent chat agent”	“conversational”	“smart speaker*”	“Voice assistant app”
“Artificially intelligent chatbot”	“Conversive agent”	“Smart virtual assistant”	“Voice assistant device”
“assistance technol*”	“Cyber individual”	“smart-home control”	“Voice assistant interface”
“assistant*”	“dedicated personal assistant”	“Smartbot”	“Voice assistant system”
“assistive application”	“Dialog system”	“Sociable agent”	“Voice assistant technology”

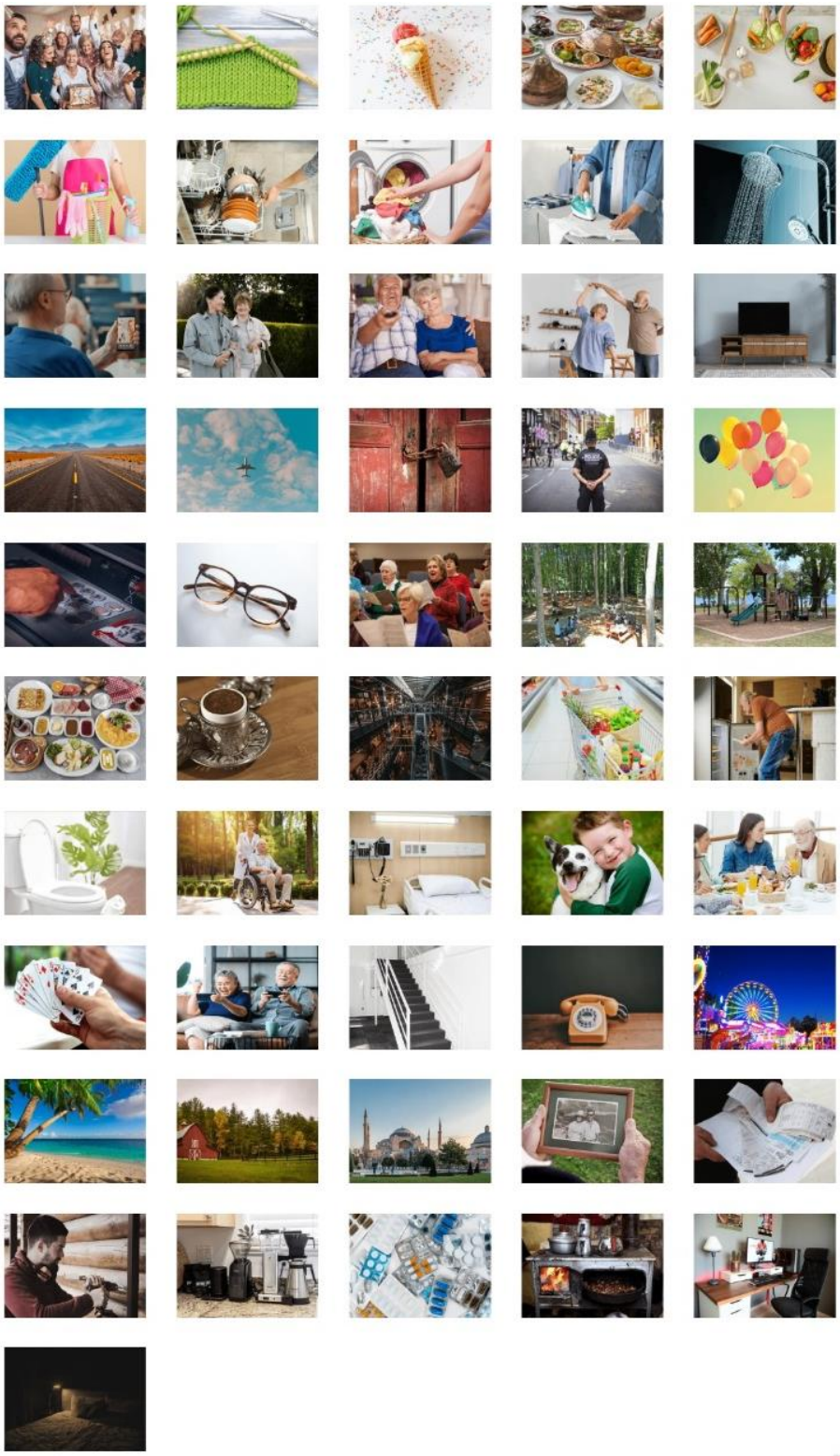
“assistive device”	“dialog system*”	“sound”	“Voice assistant”
“assistive technolog*”	“dialog* system”	“Speech recognition software”	“Voice chatbot”
“assistive technologies”	“dialogue”	“speech recognition”	“voice command*”
“audio activated”	“digital assistan*”	“speech”	“voice control*”
“audio assistant”	“digital assistant*”	“synthetic character”	“Voice controlled app”
“Audio chatbot”	“embodied agent”	“Talk bot”	“Voice controlled assistant”
“audio command”	“embodied conversational agent”	“Talking agent”	“Voice controlled device”
“audio controlled”	“embodied conversational agent*”	“Talking avatar”	“Voice controlled interface”
“audio initiated”	“ePartner”	“technology acceptence”	“Voice controlled system”
“audio interaction”	“game character”	“Text based dialogue system”	“Voice controlled technology”
“audio interactive”	“Google Assistant”	“Text-based healthcare chatbot”	“Voice device”
“audio-activated”	“Google Home”	“Text-based synchronous chat”	“Voice enabled app”
“audio-enabled”	“humanoid”	“text-to-speech”	“Voice enabled assistant”
“audio”	“Intelligent agent”	“unconstrained natural language processing”	“Voice enabled device”
“Automated chat agent”	“intelligent assistan*”	“user interface*”	“Voice enabled interface”
“automated personal assistant”	“Intelligent conversational assistant”	“virtual agent”	“Voice enabled system”
“automated personal assistant*”	“Intelligent conversational avatar”	“virtual assistant”	“Voice enabled technology”

“automated personal attendant”	“intelligent personal assistant”	“Virtual advisor”	“Voice initiated assistant”
“Automated virtual agent”	“intelligent personal assistant*”	“virtual agent”	“Voice initiated interface”
“Automatic speech recognition”	“intelligent personal attendant”	“virtual assistan*”	“Voice initiated system”
“avatar”	“Intelligent virtual agent”	“Virtual assistant”	“Voice initiated technology”
“avatar*”	“Intelligent virtual assistant”	“virtual assistant*”	“Voice interactive app”
“believable agent”	“Interactive agent”	“virtual character”	“Voice interactive assistant”
“believable character”	“interactive computer agent”	“Virtual chat agent”	“Voice interactive device”
“Chat assistant”	“Interactive conversational assistant”	“Virtual chat expert”	“Voice interactive interface”
“Chatbot”	“Interactive online character”	“virtual coach”	“Voice interactive system”
“chatbot*”	“Interactive talking program”	“virtual coach*”	“Voice interactive technology”
“Chatterbot”	“Interactive virtual agent”	“Virtual consultant”	“Voice interface”
“Chatterbox”	“Interactive voice assistant”	“Virtual conversational agent”	“voice prompt*”
“communicative agent”	“Interactive voice interface”	“Virtual host”	“voice recognition software”
“computer-assisted instruction”	“interactive voice response”	“Virtual hostess”	“Voice recognition systems”
“conversation agent”	“Interactive voice system”	“Virtual human agent”	“Voice system”

“conversational character”	“Interactive voice technology”	“Virtual human avatar”	“Voice technology”
“Conversational agent”	“interface agent”	“Virtual human persona”	“voice user interface”
“Conversational agent*”	“interface*”	“virtual human”	“voice-activated”
“Conversational AI”	“IVR”	“virtual nurs*”	“voice-assisted”
“Conversational app”	“language interface”	“Virtual online assistant”	“voice-based inter-fac*”“
“Conversational assistant”	“natural language communication”	“virtual patient”	“voice-based”
“Conversational avatar”	“natural language interface”	“Virtual personal assistant”	“voice”
“Conversational bot”	“natural language understanding”	“virtual personal assistant*”	“Voicebot”
“Conversational Character”	“non-playable character”	“virtual therapist”	“VUI”
“Conversational computer”	“Online chat agent”		

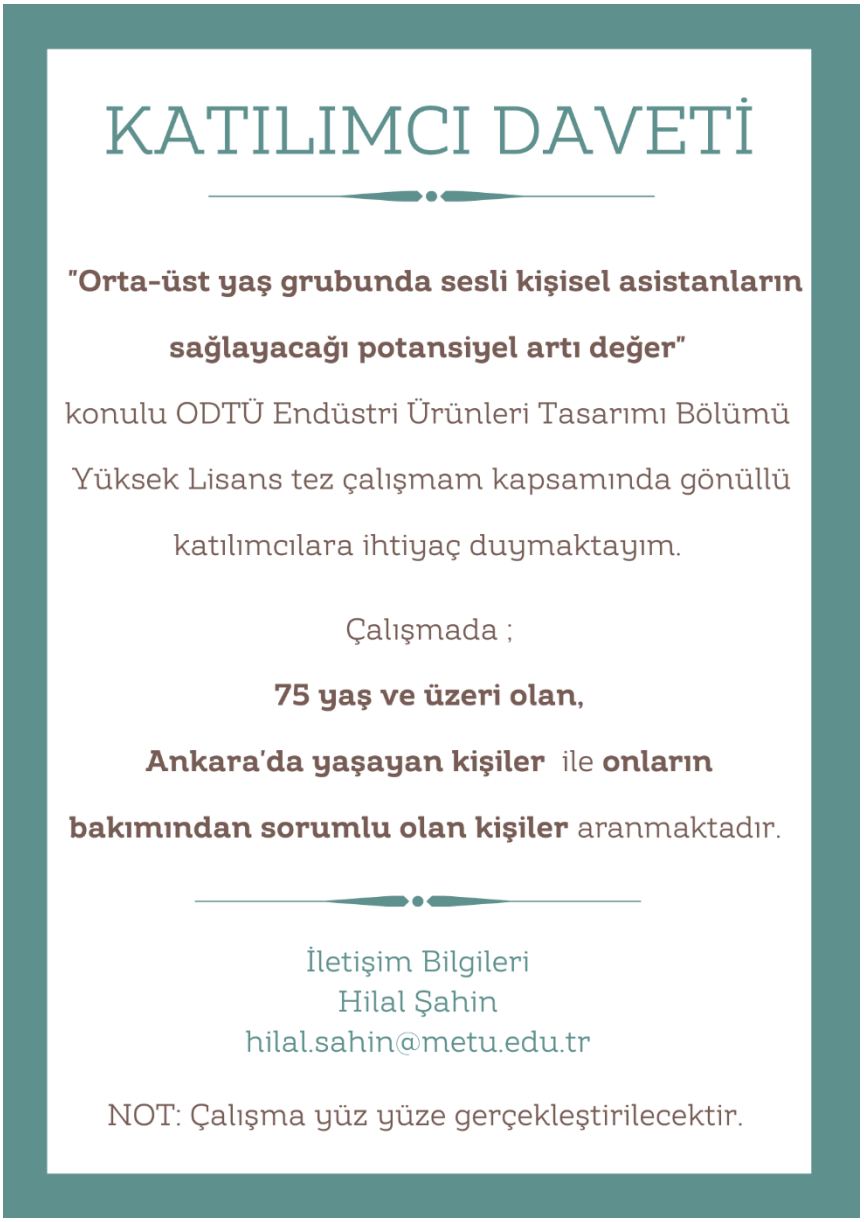
Search Terms For: Elderly			
“ag*ing”“	“ageing”	“geriatric”	“older adults”
“age”	“aging”	“old age”	“older people”
“aged over 65”	“elder*”	“old people”	“older”
“Aged, 80 and Over”	“elderly”	“old”	“senior”
“Aged+”	“Frail Elderly”	“older adult”	“seniors”

B. Picture Cards



C. The Participant Recruitment Invitations (in Turkish)

Through social media post



Through E-Mail

Merhabalar,

Ben Endüstriyel Tasarım Bölümü yüksek lisans öğrencilerinizden Hilal Şahin***"Sesli kişisel asistanların yaşlı yetişkinlerin gündelik hayatına sağlayacağı potansiyel değer"*** konulu yüksek lisans tezimi yürütmekteyim. Bu çalışma kapsamında 75 yaş ve üzeri kişilerin günlük hayatlarındaki pozitif anlara odaklanılarak potansiyel sesli asistan kullanım alanlarını araştırmak istiyorum. Bu nedenle çalışmada 2 farklı gruptan oluşan gönüllü katılımcılar ile yaklaşık 1 saat sürecek mülakat gerçekleştirmek istiyorum. İhtiyaç duyulan katılımcı profilleri ve görüşmede yer alacak başlıklar şu şekildedir;

1. **Grup:** 75 yaş ve üzeri olan, çalışma yapmamızı/konuşmamazı engelleyecek fizyolojik/nörolojik rahatsızlığı bulunmayan kişiler
2. **Grup:** Yaşlı bakımından sorumlu olan kişiler (Profesyonel olan veya olmayan-kendi yakını gibi)

GÖRÜŞME BAŞLIKLARI	
1. Grup	**2. Grup**
Kişisel/Demografik Bilgiler	Kişisel/Demografik Bilgiler
Günlük Rutinler	Günlük Rutinler
Serbest Çağrışım Etkinliği (Piknik, doğum günü gibi bazı fotoğraf kartları üzerine sohbet)	Yardımcı Araç ve Teknolojiler
Yardımcı Araç ve Teknolojiler	Sesli Asistanlar ile Etkileşim
Sesli Asistanlar ile Etkileşim	Değer ve Potansiyel Alanlar

Mülakatların mümkünse yüz yüze Ankara'da gerçekleştirilmesi planlanmaktadır. Ancak**, katılımcı tercihine veya katılımcının bulunduğu şehre göre** çalışma **çevrimiçi ortamda** da **gerçekleştirilebilir**.

Çalışmaya katılmak isterseniz veya çalışmaya dair detaylı bilgi almak isterseniz aşağıda yer alan iletişim bilgilerimiz üzerinden bizimle iletişime geçebilirsiniz. Talep olması halinde mülakat soruların tamamı da sizlerle paylaşıma açık olacaktır. Aynı zamanda bu maili ilgilenebilecek kişilere de iletebilirseniz çok sevinirim.

Desteğiniz için şimdiden çok teşekkür ediyorum.

Saygılarımla.

Hilal Şahin

İletişim Bilgileri
Araştırmacı: Hilal Şahin (hilal.sahin@metu.edu.tr)
Danışman: Assist. Prof. Dr. Gülşen Töre Yargın (tore@metu.edu.tr)
Eş Danışman: Assist. Prof. Dr. Aslı Günay (asgunay@ku.edu.tr)

D. Voluntary Participation Form (in Turkish)

Bu araştırma, Orta Doğu Teknik Üniversitesi Endüstriyel Tasarım Bölümü Yüksek Lisans öğrencisi Hilal Şahin tarafından Dr. Öğretim Üyesi Gülşen Töre Yargın danışmanlığında ve Koç Üniversitesi Medya ve Görsel Sanatlar Bölümü Dr. Öğretim Üyesi Aslı Günay eş danışmanlığındaki yüksek lisans tezi kapsamında yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Araştırmanın amacı, 75 yaş üzeri katılımcılar ve onların gündelik yaşamlarında destekçi olan kişiler ile mülakat yaparak sesli asistanların bu yaş grubuna sağlayacağı olumlu deneyimleri ve bu deneyimleri etkileyen faktörleri araştırmaktır. Elde edilen bulgulara göre, 75 yaş ve üstü kişileri kapsayacak daha iyi bir sesli asistan arayüzü için tasarım ve potansiyel kullanım önerileri sunulacaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Araştırmaya katılmayı kabul ederseniz, sizden araştırmacı ile yüz yüze görüşmeye katılmanız beklenmektedir. Yaklaşık olarak 1 saat sürmesi beklenen bu görüşmede sizlere bir dizi açık uçlu soru yöneltilecek ve bu sorulara verdiğiniz cevapların nedenleri sorulacaktır. Daha sonra yanıtlarınızı daha detaylı değerlendirebilmek için ses kaydı alınacaktır.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Çalışmada sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayınlarda ve tez çalışmasında kullanılacaktır. Yayınlarda ve tez çalışmasında kimliğinizi ortaya çıkarabilecek hiçbir bilgi paylaşılmayacaktır.

Katılımınızla ilgili bilmeniz gerekenler:

Görüşme, genel olarak kişisel rahatsızlık verecek sorular veya uygulamalar içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz çalışmayı yarıda bırakıp çalışmadan ayrılmakta serbestsiniz. Böyle bir durumda çalışmayı uygulayan kişiye çalışmadan çıkmak istediğinizi söylemeniz yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Görüşme sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Orta Doğu Teknik Üniversitesi Endüstriyel Tasarım Bölümü öğretim üyelerinden Dr. Öğretim Üyesi Gülşen Töre Yargın (E-posta: tore@metu.edu.tr) ile Koç Üniversitesi Medya ve Görsel Sanatlar Bölümü öğretim üyelerinden Dr. Öğretim Üyesi Aslı Günay (E-posta: asgunay@ku.edu.tr) ya da yüksek lisans öğrencisi Hilal Şahin (E-posta: hilal.sahin@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim/Soyisim Tarih İmza

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E. Interview Questions (in Turkish)

A. (75 Yaş ve Üzeri Katılımcılar)

(Katılımcının araştırma konusunda bilgilendirilmesi ve onayının alınması)

Bu araştırmada amacım sizin gündelik hayatınızdaki deneyimlerinizi anlamak, teknolojik ürünlerle yakınlığınızı ve sesli asistanlara yönelik düşüncelerinizi öğrenebilmek. Buradan hareketle sesli asistanların sizin hayatınızda nerelerde faydası olabileceğine dair çıkarımlar yapacağım.

KİŞİSEL BİLGİLER

Öncelikle biraz kendinizden bahsetmenizi rica edeceğim.

- Kaç yaşındasınız?
- Eğitim durumunuz nedir? (Okuma-yazma durumu)
- Çalışma durumunuz nedir?
- Medeni durumunuz nedir?
- Evinizde kimlerle yaşıyorsunuz?
- Kronik bir rahatsızlığınız var mı? Varsa bunlar nelerdir? Ne kadar zamandır bu rahatsızlığınız var?

RUTİNLER

Şimdi gündelik yaşam rutinlerinize dair bazı sorular soracağım. Eğer benim sormadığım ama aklınıza gelen yeni şeyler varsa bana bunlardan da bahsedebilirsiniz.

- Bana sıradan bir günde neler yaptığınızı anlatır mısınız?
- Bu rutinler dışında kalan günlerinizden biraz bahsedecek olursak;
- **Yemek düzeni:**
    - Yemek yapma/hazırlama/toplama düzeninizden bahseder misiniz?
    - Neler hazırlamayı/yemeyi tercih ediyorsunuz?
    - Siz mi yapıyorsunuz yoksa başkasından destek alıyor musunuz? Alıyorsanız hangi aşamalarda ve neden?

- **Alışveriş düzeni:**
    - Alışveriş düzeninizden bahseder misiniz?
    - Alışveriş listesi hazırlar mısınız?
    - Alışverişi kim yapıyor?
    - Siz mi yapıyorsunuz yoksa başkasından destek alıyor musunuz? Alıyorsanız hangi aşamalarda ve neden?
    - Gelen ürünleri nasıl yerleştiriyorsunuz, bu noktada yardıma ihtiyacınız oluyor mu? Oluyorsa neden?
- **Temizlik düzeni:**
    - Ev temizlik süreci nasıl işliyor?
    - Siz mi yapıyorsunuz yoksa başkasından destek alıyor musunuz? Alıyorsanız hangi aşamalarda ve neden?
    - Temizliği ne sıklıkta yapıyorsunuz?
    - Banyo rutuninizden bahsedebilir misiniz?
    - Bu noktada yardıma ihtiyacınız oluyor mu?
- **Hastane düzeni:** (Günlük rutinleri ve kronik hastalıklardan öğrenilenlerden yola çıkılarak)
    - Bu hastalıkla/hastalıklar günlük hayatınızı nasıl etkiliyor?
    - Hastaneye/kontrole gitme rutininizden bahseder misiniz?
    - Ne sıklıkta ve kimlerle gidiyorsunuz?
    - **İletişim/sosyalleşme düzeni:**
    - En sık kimlerle iletişim halindesiniz?
    - Bu kişilerle ne sıklıkta görüşüyorsunuz ve görüşmeleriniz nasıl oluyor (yüz yüze, telefonda vs)
    - Acil bir durumda ilk kimi/kimleri arasınız? Neden?
- **Eğlence - keyif düzeni:**
    - Hobileriniz ya da size iyi hissettiren başka aktiviteler var mıdır?
    - Neler yapmaktan hoşlanırsınız? (Bahsettiği aktiviteler göz önünde bulundurularak) Hangi programlar/hangi oyunlar/diziler/yarışmaları tercih ediyorsunuz? Neden?

- Bu aktivitelerden hangisini yalnız, hangisini başkalarıyla yapmayı tercih ediyorsunuz? Neden?
- Ne kadar zamandır, nerede, nasıl, kiminle, ne sıklıkla bu aktiviteyi gerçekleştiriyorsunuz? Bu aktivitelerden hangilerini başkalarıyla yapmaktan/paylaşmaktan keyif alırsınız?
- Bu aktiviteyi yaparken karşılaştığınız zorluklar var mı? Varsa bunlar nelerdir?

- Bunların dışında daha nadir gerçekleşen yapmaktan mutlu olduğunuz aktiviteler var mı? (Torun, bayram, bebek ziyaretleri veya tatiller/yazlık) Varsa bunlar nelerdir? Neden? Bu günler için yaptığınız bir hazırlık var mı? Bunlar nelerdir?
- Pandemiden sonra bu rutinlerinizde veya hobilerinizde herhangi bir değişim oldu mu? Varsa pandemi süresince sizi en çok zorlayan şeylerin neler olduğunundan bahsedebilir misiniz?
- Eskiden çok keyif alarak yaptığınız ama şu an yapamadığınız şeyler var mı? Neden bu aktivite size keyif veriyordu?
- Unutamadığınız sizi mutlu hissettiren bir anınızı benimle paylaşabilir misiniz?

SERBEST ÇAĞRIŞIM ETKİNLİĞİ

Şimdi size bazı kartlar göstereceğim. Aşağıda yönelttiğim sorular kapsamında bu kartları gözden geçirerek aklınıza gelen düşüncelerden bahsetmenizi istiyorum. Bunu yaparken yeni teknolojilerin sizin için ne ifade ettiğini, hayatınızda nerelerde yer aldığını ve nerelerde anlam katabileceğinizi düşünmenizi istiyorum.

- Sizce teknoloji hayatınızın hangi alanlarına anlam katabilir? (İlgili resimleri seçebilir misiniz?) Nasıl bir anlam katar? Biraz açıklar mısınız?

- Teknolojiyi anlamlı bulmadığınız alanlar neler? (İlgili resimleri seçebilir misiniz?) Neden?

YARDIMCI ARAÇ VE TEKNOLOJİLER

Şimdi biraz da sizin teknolojik aletlerle olan iletişiminizi anlamak istiyorum.

- Teknolojik ürünler denilince aklınıza ilk neler geliyor? [her biri için] onunla aranız nasıl?
- Yeni teknolojik ürünleri merak eder ve denemek ister misiniz?
- Sık kullandığınız teknolojik aletler nelerdir? (Cep Telefonu/ Bilgisayar/ Tablet/ Televizyon/Akıllı Saat)
- Kendinize ait teknolojik ürünleriniz var mı? Varsa bu ürünlerin özellikleri nelerdir? (Akıllı telefon, masaüstü bilgisayar, laptop vb.)
- Bu teknolojik alet(leri) size kim ve neden aldı? Ne zamandır bu teknolojik alet(leri) kullanıyorsunuz?
- Bu teknolojik aleti ne sıklıklarla ve hangi amaçlarla kullanıyorsunuz?
- Bu aletleri kullanmayı nasıl öğrendiniz?
- İnternet kullanıyor musunuz? Ne sıklıkla, ne amaçla?
- Kulanırken yardıma ihtiyaç duyuyor musunuz? İhtiyaç duyuyorsanız kimden nasıl yardım alıyorsunuz? (probe: neleri kendisi yapabiliyor?)
- Bahsettiğiniz teknolojik alette sık kullandığınız uygulamalar/özellikler nelerdir? Neden bu uygulamaları/özellikleri tercih ediyorsunuz?
- Kullandığınız teknolojik aletlerde çok kullandığınız/hoşunuza giden özellikler neler? Sevmediğiniz/Yapmakta zorlandığınız özellikler nelerdir?
- Kullanmaktan en keyif aldığınız sizi eğlendiren teknolojik bir üründen bahseder misiniz? Neden?
- Kullanmaktan hiç hoşlanmadığınız/sizi yoran teknolojik bir üründen bahseder misiniz? Neden?

SESLİ ASİSTANLAR İLE ETKİLEŞİM

Son olarak size çalışmamın odağı olan yeni teknolojilerden sesli asistanlara dair sorular sormak istiyorum. Kısaca tanıtacak olursam sesli asistanlar akıllı telefonlarda ya da ayrı bir cihazda sesle komut vererek size bilgi verebilen ya da sizin için bazı

görevleri yerine getiren bir kişisel yardımcıdır. Daha anlaşılır olması için şimdi bu asistanların yapabileceklerine dair size kısa iki video izletmek istiyorum. Bu videoda yapılanları da göz önünde bulundurarak size bazı sorular soracağım.

- Neler hissettiniz, genel olarak ne düşünüyorsunuz? Kullanmak ister miydiniz? Neden?
- Daha önce hiç sesli asistanları duydunuz mu veya kullandınız mı? Biliyorsanız bunlar nelerdir? (Biliyorsa ve kullanmadıysa) Neden kullanmadınız? Ne zaman ve ne amaçla kullandınız?
- Yeni teknolojiyle artık evdeki bazı ürünlerin de konuşabildiğini görüyoruz. Evinizdeki ürünler konuşabilseydi, en çok hangi ürünle/ürünlerle konuşmak isterdiniz? Ona ne derdiniz? O size ne desin isterdiniz? Nerede kullanmak isterdiniz? (evde, hastanede, dışarıda vs.)
- Sizin günlük hayatınızı düşündüğümüzde sizce bu asistanlar size günlük hayatınızda nerede yardımcı olabilirdi? Neden?
- Bunların dışında ise bu alanlarda da (fotoğraf kartları gösterilecek) sesli asistan sizlere yardımcı olabilir. Bunlardan hangisini/hangilerini tercih ederdiniz?Neden?

A. (Bakım Hizmeti Veren Katılımcılar)

(Katılımcının araştırma konusunda bilgilendirilmesi ve onayının alınması)

Bu araştırmada amacım 75 üzeri bir yaşlıya günlük işlerinde yardımcı olan biri olarak olarak gündelik hayatınızdaki deneyimlerinizi ve kendisiyle olan ilişkinizi anlamak. Buradan hareketle sesli asistanların ilgilendiğiniz kişinin hayatında nerelerde faydası olabileceğine dair çıkarımlar yapabilmek.

KİŞİSEL BİLGİLER

Öncelikle biraz kendinizden bahsetmenizi rica edeceğim.

- Kaç yaşındasınız?
- Çalışma durumunuz nedir?

- İlgilendiğiniz kişi ile bağınız nedir?
- Ne sıklıkla onunla ilgileniyorsunuz/görüşüyorsunuz?
- Ne zamandır bu kişinin bakımından siz sorumlusunuz?

RUTİNLER

Sesli asistanların ilgilendiğiniz kişinin hayatında hangi kısmında olmasının daha anlamlı olabileceğini anlamak için gündelik yaşam rutinlerinize dair bazı sorular soracağım. Eğer benim sormadığım ama aklınıza gelen yeni şeyler varsa bana bunlardan da bahsedebilirsiniz.

- Bana sıradan bir günde ilgilendiğiniz kişi ile ilgili neler yaptığınızı anlatır mısınız?
- Hangi konuda ona destek oluyorsunuz? (Sağlık, doktor vs.)
- Size en çok ne zaman ve ne için ihtiyaç duyar?
- Bu süreçte ne gibi sorunlarla karşılaşıyorsunuz ve bunları çözmek için neler yapıyorsunuz?
- Pandemiden sonra bu rutinlerde değişiklikler oldu mu? Olduysa bunlar nelerdir? Neden?

YARDIMCI ARAÇ VE TEKNOLOJİLER

Şimdi biraz da teknolojik aletlerin sizin ilgilendiğiniz kişi ile aranızdaki ilişkideki yerini/rolünü anlamak istiyorum.

- Bakım verdiğiniz kişi ne tür teknolojik araçlar kullanıyor? Açıklar mısınız? Bu araçları hangi amaçlarla - nasıl kullanıyor?
- Onunla kullandığınız ya da iletişime geçtiğiniz teknolojik aletler var mı? Varsa bunlar nelerdir? Neden?
- Bu teknolojik aleti kullanırken sizin yardımınıza ihtiyaç duyuyor mu? Duyuyorsa hangi konularda? Neden?
- Onun bilgilerini takip etmek için kullandığınız uygulamalar/araçlar vs. var mı? Varsa hangileri ve neden bu uygulamaları/araçları tercih ediyorsunuz?
- (Kullanmıyorsa) Kullanmamanızın sebeplerini öğrenebilir miyim?

SESLİ ASİSTANLAR İLE ETKİLEŞİM

Son olarak size çalışmamın odağı olan yeni teknolojilerden sesli asistanlara dair sorular sormak istiyorum. Kısaca tanıtacak olursam sesli asistanlar akıllı telefonlarda ya da ayrı bir cihazda sesle komut vererek size bilgi verebilen ya da sizin için bazı görevleri yerine getiren bir kişisel yardımcıdır. Daha anlaşılır olması için şimdi bu asistanların yapabileceklerine dair size kısa iki video izletmek istiyorum. Bu videoda yapılanları da göz önünde bulundurarak size bazı sorular soracağım.

- Bu asistanlar hakkında ne düşünüyorsunuz?
- Daha önce hiç sesli asistanları duydunuz mu veya kullandınız mı?
- Biliyorsanız bunlar nelerdir?
- Bu araçları ilgilendiğiniz kişinin bakımında kullandınız mı? Kullandıysanız hangi amaçla ve ne zaman tercih ettiniz?
- (Eğer profesyonel bir kişi ise geçmiş deneyimlerinizden yola çıkarak) Bu araçların yaşlı bakımında hangi konularda destek olabileceğini veya zorlayabileceğini düşünüyorsunuz?
- İlgilendiğiniz kişi ile konuşabilecek bir ürün olsaydı ondan beklentileriniz neler olurdu? Bahsedebilir misiniz?
- İlgilendiğiniz kişiyi ve onun yaşam şartlarını düşünerek sizce böyle bir asistan onun için neleri yapabilirdi? Ne konuşsun, ne yapsın isterdiniz? Neden? Diyelim ki ilgilendiğiniz kişiye bu şekilde bir sesli asistan hediye aldınız, bu ürünü kullanmayı ona nasıl öğretirdiniz? Neden?

DEĞER VE POTANSİYEL ALANLAR

- Onun hayatında keşke şunları yapabilen bir ürün/kişi olsaydı dediğiniz bir şey var mı? O yapmasını beklediğiniz özellikler nelerdir?
- Size onun bakımında ihtiyaç duyduğunuz alanlar/ürünler var mı? Varsa bunlar nelerdir, biraz bahsedebilir misiniz?

- Birlikte yapmaktan keyif aldığınız aktivitelerden bahsedebilir misiniz? Bu aktiviteyi ne zamandır, ne sıklıkla, nerede gerçekleştirirsiniz? Sizden başka birileri de bu aktiviteye dahil olur mu?
- Bu aktiviteyi yaparken karşılaştığınız zorluklar var mı? Varsa bunlar nelerdir? Neden?
- Kendisi ile ilgili yaşadığınız unutamadığınız bir olumlu ve bir olumsuz bir anınızı paylaşabilir misiniz?

F. The Source List for Systematic Literature Review

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