Engaging Families in Healthy Ageing:

A Co-Designed Approach

Unlocking Ageing Conversations and Planning, through a Game

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STUDENT REPORT

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Abstract

As societies worldwide face demographic shifts towards aging populations, there is a growing urgency to address the challenges associated with aging and explore opportunities that promote healthy aging. However, discussing topics related to aging can often be stigmatized or overlooked, leading to a lack of awareness and planning. In response to these challenges, this master thesis explores the development of a tool to facilitate meaningful discussions on aging and incite healthy aging planning. Drawing on a participatory design approach, diverse stakeholders were involved, including older adults, caregivers, families, healthcare professionals and experts on the field, to ensure alignment with their needs and concerns when defining the concept and developing prototypes. Through brainstorming and co-design sessions, a dialogue game was developed, serving as an "ice breaker" to help families initiate conversations about their preferences in old age. A concept for creating a platform that provides valuable resources and guidance for healthy aging planning is also discussed. This thesis provides evidence that a final product can be created using a participatory design approach to support social equity, inclusion, and awareness of healthy aging practices, contributing to the field of sustainable design engineering.

Keywords: Healthy Ageing, Co-Design, Older Adults, Families, Conversations, Planning

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1

INTRODUCTION

1. Introduction

People around the globe keep experiencing an unprecedented increase in longevity, and despite previous claims that we will be reaching a tipping point in life expectancy, there is no evidence that it will happen anytime soon (Buskens et al., 2018). The median age in the European Union (27 countries) in 2023 was 44.4 years and is projected to increase to 50.2 in the year of 2100, an increase of 13% in the next 77 years (Eurostat, 2023). In the next 50 years, the number of Europeans over 65 is expected to double and over 80 nearly tripling (European Commission, 2022).

While ageing is a societal triumph, these changes in demographics have long-term consequences for the economic survival, social security systems, and health systems in European nations. An increase in age-related chronic illnesses and cognitive declines has coincided with an increase in average life expectancy, suggesting that health span has not kept up with lifespan (Buskens et al., 2018). Consequently, demand for long-term care is outpacing public spending. It is projected that by 2030, there will be 33.7 million people in the EU who require long-term care, and by 2050, there will be 38.1 million (Murphy et al., 2023). Furthermore, over a third of care providers in the EU work without licenses, social protections, or professional support. This makes it harder to hire and keep long-term care staff, creating additional problems for the sustainability of care systems across Europe (Murphy et al., 2023).

An ageing population presents complex obstacles to reaching the Sustainable Development Goals (SDGs). Older adults are often more vulnerable, experiencing health inequalities, safety concerns, a decreased ability to recover from disasters, a higher risk of contracting illnesses and pandemics, and reduced mobility (Fong et al., 2022). Addressing economic and social changes that come with ageing and old age is crucial for meeting the SDGs, as it intersects with goals like poverty reduction, reduced inequality, fair working conditions, improved health, economic prosperity, and sustainable urban development (United Nations Development Programme, 2017).

From a more balanced perspective, evidence shows that caring for older adults is not excessively costly and that the rise in ageing can actually offer benefits to the economy and society, as long as older adults remain healthy and active (Greer et al., 2022). The problem is that the last 20% of an individual's lifespan is often spent unhealthily, highlighting the imperative for policies promoting healthy ageing (European Commission, 2022). It is critical to create conditions that allow older people to live autonomous, healthy, and productive lives, and encourage them to make their own decisions on matters that impact them. It is imperative that we transcend the idea of older adults as a simply "vulnerable group" and instead acknowledge and enable them as proactive participants in the pursuit of healthy ageing (United Nations Development Programme, 2017).

In recognition of this, the United Nations (UN) has launched the UN Decade of Healthy Ageing, which is a collaborative effort involving multiple sectors and stakeholders, focused on reshaping how ageing is perceived, promoting age-friendly environments, building integrated and responsive healthcare systems, and guaranteeing long-term care for older adults who require it (World Health Organization, 2021).

Despite governmental efforts to create strategies and policies that include and benefit older adults, there remains a significant stigma

surrounding the topic of ageing. The notion that people begin ageing from the moment they are born is often overlooked, as many individuals continue to view ageing as a disease and avoid discussing and preparing for the later stages of their lives. Nonetheless, individual and family planning plays a critical role in navigating the complexities of ageing. As people age, they face various physiological, psychological, and social changes due to major life events, such as retirement, loss of loved ones, relocation, and social isolation (Azizi et al., 2016). Furthermore, difficult decisions are often placed on family members, such as the choice of care for an older relative who lost intrinsic capacities (Scott & Funk, 2023). Therefore, it is vital to facilitate early and ongoing conversations about ageing within families to ensure that the preferences and autonomy of future older adults are respected.

To address these complex challenges, we chose participatory design, a collaborative design approach that offers significant benefits for social sustainability by fostering inclusivity, empowerment, and shared ownership among participants when developing solutions (Sanders & Stappers, 2008). Our co-design process aimed to create a tool that encourages dialogue about ageing, empowers decision-making, supports planning, and promotes healthy ageing.

Thus, this thesis seeks to answer the following research question:

How to co-design a tool that encourages families to initiate conversations and personalized planning for healthy ageing?

1.1. Reading Guide

This report consists of seven chapters that support the question's foundations and proposed solution.

The literature on healthy ageing, sustainable goals, the importance of planning for healthy ageing and how the family involvement has an impact, conversation tool examples to facilitate sensitive topics, and co-design as an approach for our project, is the focus of the second chapter, which comes after this one.

Chapter three presents the theories and methods used throughout the project to research, analyse, and co-create the solution.

The results of the empirical material that defined the research question and the solution's objectives are provided in the fourth chapter.

Chapter five is entirely dedicated to the solution space, where, through co-design and staging negotiation spaces, the conceptualization, testing and development of the tool is explained.

In chapter six, a reflection on the strengths and limitations of our project is presented, along with the contribution to the Sustainable Design Engineering field and future research.

Lastly, we conclude on what the project has achieved in chapter seven, the conclusion.

2

LITERATURE RESEARCH

2. Literature Research

2.1. Healthy ageing

> *"Longer lives are one of humanity's greatest achievements. However, we don't just want to add years to our lives. We also want to enjoy good health and well-being in later life. This is healthy ageing" (Decade of healthy ageing, 2022).*

Although ageing is a positive social development, it can also present certain difficulties. Among those challenges is the acknowledgment that "many people live longer, but do not live well" (World Health Organization, 2019b). As a result, governments and cultures worldwide now consider healthy ageing to be of utmost importance.

Before the 1960s, ageing was frequently thought to be a process characterized by a steady decline that ended in mortality (Miķelsone et al., 2023), but later on, theories of "successful ageing" were presented from a more positive angle (Behr et al., 2023).

In 1987, Rowe and Kahn's work transformed the "successful ageing" field by demonstrating significance of both intrinsic and extrinsic aspects in a person's health across different age groups (Lu et al., 2019). However, it has been criticized because it exaggerates the importance of individual behaviour and places heavy emphasis on the "absence of disease" as a prerequisite for successful ageing (Behr et al., 2023; Miķelsone et al., 2023). To address this, Rowe & Kahn broadened the concept of successful ageing in 1997, acknowledging the difficulties in reaching total freedom from illness or incapacity in old age (Rowe & Kahn, 1997; Miķelsone et al., 2023) and highlighting the influence social and environmental factors had on healthy ageing, while also promoting preventive factors (Behr et al., 2023; STRAWBRIDGE & COHEN, 2002).

In 2002, a "global policy guidelines for active ageing" were introduced by WHO (Miķelsone et al., 2023). This aimed to promote positive view about ageing and improve the quality of life by maximizing health, engagement, and safe opportunities for older adults (Behr et al., 2023).

Furthermore, WHO published the "World Report on Ageing and Health" in 2015 (World Health Organization, 2015), and since then they have been leading the creation of the Healthy Ageing Strategy, combining earlier ideas into a cohesive framework (Miķelsone et al., 2023).

According to the WHO, the concept of healthy ageing encompasses more than just the absence of disease (Michel & Sadana, 2017; World Health Organization, 2020b), it is "the process of developing and maintaining the functional ability that enables well-being in older age" (Miķelsone et al., 2023; World Health Organization, 2023). "Functional ability" encompasses an individual's capacity to fulfil their basic needs, learn, grow, make-decisions, move around, establish, preserve relations, and make contributions to society (World Health Organization, 2020b). Both the living environment and intrinsic capacities are factors of one's "functional ability":

The "intrinsic capacity" comprises all of an individual's mental and physical capacities that enable them to carry out simple daily tasks and it is largely impacted by the existence of illness, disability, and changes that are related to age (World Health Organization, 2020b).

The environment consists of social and health policies, relationships, housing, transportation, facilities, and social services (World Health Organization, 2020b).

It is crucial to consider that while the environment can help compensate for declining intrinsic capacities, it is also important to acknowledge that the environment might have played a role in causing a decline in the first place (Panagiotakos et al., 2023).

2.2. Goals Toward Sustainable Ageing

Given the substantial and growing number of people who are older than 65 worldwide, it is critical to prioritize sustainable ageing in order to promote a healthier planet (Mavrodaris et al., 2021).

In 2015, world leaders adopted the 2030 Agenda for Sustainable Development with the commitment to 17 SDGs. These goals aim to end poverty, protect the planet, and reduce inequalities through the integration of economic growth, social well-being, and environmental protection, providing a path forward for addressing challenges including environmental degradation, climate change, human rights violations, and conflict and guaranteeing that no one is left behind (United Nations, n.d.).

According to WHO (2019), a commitment to the SDGs includes being committed to promoting healthy ageing since it is a necessary condition for guaranteeing healthy lives, boosting well-being, reaching gender equality, and minimizing differences among humans, while also creating inclusive, safe, resilient, and sustainable cities (World Health Organization, 2019a).

Recognizing the accelerated pace of population ageing compared to previous decades, the UNGA has proclaimed the period from 2021 to 2030 as the UN Decade of Healthy Ageing. The UN Decade of Healthy Ageing is an international collaboration in line with the final ten years of Agenda 2030, the SDGs, and the commitment to "leave no one behind" (World Health Organization, 2020a). Currently, it focuses on four main areas (1) changing attitudes and perceptions about ageing, (2), creating supportive communities for older adults, (3) providing integrated, person-centred care and primary health services tailored to older adults and (4) ensuring access to long-term care for those in need (World Health Organization, 2023).

These areas are supported by four enabling factors: hearing different perspectives, nurturing leadership, building capacity, connecting stakeholders globally, and strengthening data, research, and innovation. In general, the goal is to ensure that older people, their families, and communities enjoy dignified, healthy, and fulfilling lives (World Health Organization, 2023).

These goals are closely linked to 11 SDGs related to healthy ageing: SDG1 to - SDG5, SDG8 - SDG11, SDG 16, and SDG 17 (World Health

Organization, 2020a), with the following being the ones used the most in literature (Shevelkova et al., 2023):

SDG 1: Eliminate all forms of poverty worldwide. Preventing poverty among older adults demands adaptable policies for retirement, public financed pensions, robust social security, access to healthcare, and long-term care. (World Health Organization, 2020a)

SDG 3: Ensuring well-being and healthy lifestyles for all ages will make it possible for older people to contribute to society longer. This goal underscores the need for accessible healthcare services, preventive care, and social systems rather than systems based only on disease (World Health Organization, 2020a).

SDG 10: Reduce inequality is very important because older people frequently face unequal access to services and assistance in their homes, neighbourhoods, and communities due to factors such as gender, ethnicity, or education, it is crucial. Policies to address such disparities across all sectors are necessary for healthy ageing (World Health Organization, 2020a).

SDG 11: Sustainable cities and communities emphasizes the importance of creating inclusive, safe, resilient, and sustainable urban environments that promote age-friendly communities, accessible infrastructure, and social inclusion initiatives, all contributing to healthy ageing (World Health Organization, 2020a).

In summary, within the context of sustainable development, healthy ageing involves a broad perspective that takes into account physical, financial, social, and emotional well-being, along with the importance of later life (Yoon et al., 2021). Social policy, infrastructure, and living conditions are all important factors in healthy ageing. Yet, the majority of studies that have been conducted on older people have concentrated on the goal components of both environmental and physical well-being. This focus ties institutional elements, the physical living environment, and lifestyle choices to sustainability. Nevertheless, there is still a lot to learn about maintaining good health and well-being as one ages. As a result, the well-being and social inclusion of senior citizens should be prioritized in sustainable ageing studies (Yoon et al., 2021).

2.3. The Importance of Planning for Healthy Ageing

As people age, they face a variety of physiological, psychological, and social changes that can be challenging to navigate. Besides biological changes, older adults often experience major life events like retirement, losing loved ones, moving homes, and social isolation (Azizi et al., 2016). Planning and preparation are essential to adjusting to those changes. Individuals who are prepared have reduced levels of anxiety and depression, as well as improved levels of well-being and life quality of life (Kornadt et al., 2019; Solhi et al., 2022b). Planning is a multidimensional process that goes beyond simple financial planning for retirement, it should, instead, take into account all aspects of life, including leisure, family, social relationships, health, fitness, and housing (Solhi et al., 2022b). Planning serves as an important means to improve coping skills and make the most of opportunities during ageing (Solhi et al., 2022a).

Advance care planning (ACP) encourages in-depth conversations with older persons before they lose capacity actively engages them in their own care, fostering a mutual understanding of their preferences for future medical treatment (Zhou et al., 2024). ACP is an iterative process that allows people to identify values and preferences with family members and providers (Zhou et al., 2024). However, ACP focuses primarily on end-of-life health care decisions. A more comprehensive approach is needed to prepare for the full spectrum of healthy ageing.

In summary, early preparation produces the greatest benefits for health and quality of life (World Health Organization, 2019b). Preparing for age-related changes should be a constant concern throughout life (Solhi et al., 2022a).

2.4. Family Involvement in Age-Related Decisions

Family relationships are essential for the physical and emotional well-being of the older adults (Carr & Utz, 2020). However, family members, who often become informal caregivers, may feel unprepared for their role and experience a heavy burden that affects their own health (Liu et al., 2020). Family members may feel forced to make difficult decisions when an older person's decision-making capacity is impaired (Scott & Funk, 2023). Most end-of-life care decisions are made by the family after a crisis, without taking into account the patient's wishes and this happens because, as studies show, people rarely engage in discussions regarding their future care (Festvåg et al., 2024).

2.5. Game Thinking: Games as a Conversational Tool

Game Thinking is defined as the use of games and game-like approaches to solve problems and enhance experiences in non-game contexts. Serious Games are a key application of Game Thinking, which are designed for purposes beyond entertainment, including Teaching Games that impart skills through game play, Meaningful Games that promote important messages and encourage change, and Purposeful Games that achieve real-world outcomes, demonstrating the power of game-based solutions in addressing complex and sensitive topics (Marczewski, 2015).

Games have been known for their ability to create safe spaces that facilitate engagement in sensitive topics, such as cancer, and anxiety, while also stimulating behavioural changes across diverse health contexts, including dietary habits, smoking, and exercise adherence, among others (Van Scoy et al., 2016). Studies have also shown that behavior can be changed by learning through games (Wehbe et al., 2022).

Example of a Game as a Conversational Tool: Go Wish

Various studies mention a notable example of a tool developed to help initiate conversations about delicate subjects, a card game called "Go Wish" (Coda Alliance, n.d.). This game was created by a non-profit organization called Coda Alliance based in U.S. and it is made of 36

cards, each containing a statement that reflects common preferences and values related to the dying process (Coda Alliance, n.d.). The game was especially designed to facilitate the discussion about the end of life wishes in a simple language to allow patients to express their preferences of care in the face of death, allowing for a dignified death.

This game has been tested and used in different contexts, such as with patients on inpatient services, with patients with some sort of cognitive impairment, with parents of children with a fatal disease, as a tool to teach medical students, and in different countries, e.g.: US, Brasil, Sweden, Belgium, France, China (Chew et al., 2021;(Chew et al., 2021; Dupont et al., 2022; Johansson et al., 2022; Lefuel et al., 2022; Paiva et al., 2024; Perin et al., 2022).

The cards are an effective way to start conversations about the care and wishes for the end of life "between patients, their loved ones and their medical care providers" (Menkin, 2007), and patients who used the game reported a better understanding of the importance of documenting and discussing their preferences before they become unable to make decisions themselves, this way relieving the burden from their family members or loved ones (Litzelman et al., 2017; Paiva et al., 2024).

2.6. Co-design as an Approach to Healthy Ageing

Co-design, a collaborative design approach involving end-users and other stakeholders in the creation process, is increasingly recognized for its potential to improve healthcare results, community engagement, and sustainability outcomes. In the context of healthy ageing, where discussions and planning are crucial for promoting well-being among older adults, co-design offers an effective means to develop tailored tools and platforms. This section of the literature research explores the historical background to understand where this approach emerged from, then we dive into its main objectives and roles of those involved. Finally, we provide examples found in literature, including challenges and best practices.

Origins

Co-design is closely linked to the tradition of Participatory Design (PD), which holds a core principle that understanding a person's experience is achievable only through their active participation in expressing it (Sanders & Stappers, 2008; Steen, 2013).

The origins of PD are broad, however, commonly associated with Scandinavia in the 1970s, a period marked by post-war political movements striving for industrial democracy (Gregory, 2003). As computer systems began to be introduced into workplaces, trade unions recognized the significant impact this would have on workers and the importance of advocating not just for their wages but also for their involvement in decision-making processes regarding the use of these technologies and how these would affect their work (Simonsen & Robertson, 2013).

Three project types emerged within PD as a result of these early experiences: Knowledge Strategy projects which aimed at addressing the uneven knowledge distribution among workers and system developers;

Design and Intervention projects that presented technological alternatives that reflected various starting points; and Ethnographic analyses of work, workers, and technology, which addressed the need to understand context in the face of rapidly evolving technological landscapes (Simonsen & Robertson, 2013).

Originally, the labour movement and its ideals were the focal point of PD rather than the movement's idea of modern design in general. However, by the 1980s, PD thinking and design practice had made these contemporary design ideals more apparent (Bannon & Ehn, 2012). One prominent example is the UTOPIA project, in which a range of experts worked in conjunction with labourers and their unions to develop tools for specialized labour, presenting innovative methods like "design-by-doing", where mock-ups and other prototyping devices allowed for labourers to actively engage in the design process (Ehn, 2017). By expanding the design process to include end users as co-designers, these initiatives represented a break from conventional design methods, enhancing the design outcomes and promoting a more democratic approach to innovation.

Co-design today

Today, while the term Co-design continues to share many principles of traditional PD, and both terms are often used interchangeably, Co-design places greater emphasis on the collaborative creative process involving diverse stakeholders, including non-designers and designers. More importantly, this approach has expanded beyond the workplace and is now widely applied across a variety of fields, including sustainability, health and education (Sanders & Stappers, 2008).

> *"Codesign is a collaborative approach where designers work together with non-designers to create solutions. Designers act as facilitators and guide the participants through the design process. Codesign aims to harness the collective wisdom and insights of everyone involved, especially the end-users, to innovate and solve problems effectively." (Interaction Design Foundation - IxDF., 2023).*

Co-design encourages citizen participation to address or enhance specific issues, such as improving services or products, enhancing prevention activities, increasing resources, providing better training for health promotion staff, and developing evidence-based initiatives (Vargas et al., 2022). By employing the collective creativity of a diverse group, this approach signifies a shift from viewing design as the sole domain of lone experts (Steen, 2013). It is the process of bringing users and stakeholders into the design team as "experts of their experience" (Sanders & Stappers, 2008).

The methodologies vary, ranging from design-focused strategies that utilize generative tools to research-oriented approaches such as applied ethnography (Steen, 2013). Examples of methods used in co-design are interviews, prototyping, questionnaires, focus groups, personas, wireframing, sketching, storyboarding, mockups, probes, usability testing, and storytelling (Noorbergen et al., 2021).

During co-design sessions, the focus is on driving a collaborative exercise with those who will be impacted by the technology, products, or services being designed (Simonsen & Robertson, 2013). The primary focus should be on assisting participants in understanding possibilities and alternatives, as well as exploring how to accomplish specific goals, rather than solely focusing on their preferences (Bødker et al., 2022).

Co-design Project Examples

In the field of sustainability, where problems are multifaceted and promoting change can be difficult, co-design is a valuable approach (Moser, 2016. Some studies underlined the need of including local communities in the creation of research agendas focused on sustainability. Rather than advocating for immediate solutions, these studies put more of an emphasis on collaboratively developing research agendas to solve systemic problems and promote long-term sustainability goals (Busse et al., 2023). For example, one project used co-design to involve communities in cutting carbon emissions (White & van Koten, 2016).

Co-design has also been used in urban planning projects to involve the public in the creation of public spaces and services, creating environments that are both sustainable and optimal for citizens (Sanders & Stappers, 2008), and in the development of new software and other digital technologies, such as websites and applications, by involving future and current users to ensure they meet their expectations (Spinuzzi, 2005).

In healthcare, co-design has been applied to create patient-centred solutions, significantly improving healthcare delivery by aligning services with patient needs and preferences (Bate & Robert, 2006). It is also applied to support the process of prioritizing and creating research agendas, as well as contributing to the design, outcomes, and materials of studies (Slattery et al., 2020).

In the field of ageing and elder care, involving older adults in the design process has proven crucial in producing technologies and services that meet their unique requirements and improve their quality of life (Lindsay et al., 2012).For example, a co-design project in Milan, Italy, aimed to design a small, sustainable restorative garden that enhances both physical and mental well-being. The project emphasized the importance of integrating objective environmental factors with personal attitudes towards green spaces. By involving older adults in the co-design process, the project ensured that the garden met their specific needs and preferences, encouraging them to engage with and benefit from the green space (Fumagalli et al., 2020). Co-design was also applied in case studies to stimulate the creativity of fifty to sixty four years old Chinese citizens, described as young elderly, integrating various resources, and establishing organization platforms and design networks (Zou et al., 2024). The approach was effective in empowering them and promoting local innovation. It showed that among the older adults, a creative group could emerge.

Challenges and Best Practices

Coordinating multidisciplinary teams, maintaining engagement, and managing differing points of view are just a few of the major challenges that co-designing solutions brings. For example, Sakaguchi-Tang et al noticed in their project that one of the participants was frustrated and feeling excluded when another participant was independently building the prototype (Sakaguchi-Tang et al., 2021). Different stakeholder backgrounds can impact communication, and participants may become less autonomous as a result of an excessive dependence on designers (Huybrechts et al., 2018; Pirinen, 2016). In order for co-design to be effective, facilitators must provide each participant the tools they need to participate fully, encourage clear communication, and address any disparities that may surface (Sakaguchi-Tang et al., 2021).

Recognizing and navigating the diversity present in communities is a significant task for researchers and designers. Denying the influence of geography, identity, or common interests and practices on the formation of desires, capabilities, expectations, and results would be a mistake. However, it is imperative to exercise caution to avoid stereotyping participants or communities (Disalvo et al., 2012).

Accessing the same group of participants consistently can be challenging, such as in the healthcare industry. Although co-design offers significant advantages such as enhancing staff comprehension of patient experiences and improving overall patient satisfaction, Sanz et al. (2021) explain that high clinical workloads can make an ongoing engagement difficult (Sanz et al., 2021), requiring even more the use of tactics like digital sensitization packages (Trischler et al., 2019).

In the public sphere, Björgvinsson et al. (2012) mention challenges such as engaging marginalized groups and managing complex power dynamics within families (Björgvinsson et al., 2012).

Due to physical and cognitive limitations, it can be particularly challenging to involve older adults in co-design. These limitations may make it difficult for them to understand the goals of the project and feel comfortable participating in design and feedback activities (Joshi & Bratteteig, 2016; Rice & Carmichael, 2013; Uzor et al., 2012). Older adults may struggle with technology due to cognitive differences and traditional mental models, highlighting the need for user-friendly interfaces and innovative engagement approaches (Rice & Carmichael, 2013). Digital exclusion as well as different levels of literacy further complicate their involvement (Schreurs et al., 2017; Seifert et al., 2021). The stigma associated with aging may also deter older adults from participating in co-design activities because they may not identify in the category of older people or see any immediate benefits for themselves (Mannheim et al., 2023).

Designers need to make sure older adults feel valued and empowered to participate actively in order to address these issues. A representative and inclusive co-design environment must be established, and open communication must be maintained (Sanders & Stappers, 2008). According to Yang and Sung (2016), achieving meaningful and inclusive outcomes through co-design necessitates continuous engagement, adaptability, and the capacity to navigate.

3

THEORIES & METHODS

3. Theories & Methods

3.1. Participatory Design (Co-Design)

Participatory Design (PD), also known as co-design, is an inclusive and collaborative approach to design that actively involves stakeholders, including end-users and relevant actors, throughout the design process (Simonsen & Robertson, 2013). This was a guiding principle for our project.

The PD mindset emphasizes equality and the belief that anyone can be creative and capable of influencing changes in their lives. They are experts in their own experiences and should be actively involved in the design process (Blomkamp, 2018). This approach guarantees that those who will use the solution or be impacted by it, will have a significant say in its development (Sanders & Stappers, 2008). By involving users in the co-design process and understanding real-world contexts, PD aims to produce designs that are more usable, accessible, and ethically sound (Simonsen & Robertson, 2013).

In our project, we implemented PD by engaging relevant actors such as older adults, future older adults, their families, caregivers, directors and experts in the field. The methods used in PD are diverse, ranging from generative tools that facilitate creative idea generation to research-oriented approaches like applied ethnography (Steen, 2013). Our process included interviews, observations, and co-design sessions which will be explained in more detail in the methods section.

PD's emphasis on collaborative participation aligns with social sustainability by addressing power imbalances and promoting social equity (Zhang, 2022). This was particularly important in our project, since we aim to provide a sense of agency, especially to current and future older adults who often lack decision power, potentially contributing to healthier ageing.

3.2. Staging Negotiation Spaces

Staging Negotiation Spaces (SNS) is an actionable framework inspired by Actor-Network Theory (ANT) and Participatory Design (PD) to provide insights into the co-design process.

While PD emphasizes collaboration with different stakeholders, literature struggles to explain the dynamics of how designers facilitate these interactions and interpret the complex relationships between them. SNS addresses this gap by using a theatrical metaphor to describe the designer's role and the iterative process of staging, negotiating, and re-framing within collaborative design (Figure 1), offering a structured way to understand and guide these interactions (Pedersen, 2020).

In SNS, the designer is not only an expert in their field but also a facilitator, viewed as a stage director in the theatrical metaphor. In the backstage, the facilitator sets the scene by interpreting the current situation and objectives, then preparing all necessary elements for the frontstage. The frontstage is where the designer facilitates the interactions between various actors, empowering them to express and negotiate their values and concerns through the use of various intermediary objects, (Pedersen, 2020).

Unlike traditional linear design processes, SNS emphasizes continuous re-framing of concerns and iterative design refinement based on ongoing feedback and negotiation.

In our project, we used the SNS framework to organize idea development, facilitate and manage collaboration with key actors, and ensure that our design process remained inclusive, adaptive, and responsive to diverse concerns.

In the staging phase, we were guided by the four fundamental moves of SNS which are interpreting, framing/re-framing, producing objects, and inviting actors, (Figure 1) (Pedersen et al., 2022). First, we interpreted the current situation within ageing by identifying the different challenges found in literature and in our ethnographic research. This allowed us to frame the scope of our project and brainstorm different concepts that align with initial matters of concern. Then we produced several objects that served as intermediaries in the negotiating phase, where they were circulated between actors to gather different opinions and address diverse concerns. These included a design specification document that reflected the objectives of the concept, a prototype of a dialogue game which is the core of our proposed solution, and a feedback sheet for actors to engage and add feedback. Finally, we invited different actors' to co-design with us, including potential users (families) and experts (care home director, sustainable design engineer, and psychologists).

This framework allowed us to be better prepared for the co-design sessions, helping us concretely present knowledge and foster meaningful negotiations. As a result of the negotiations, we kept incorporating new insights into the project and iterating our prototype.

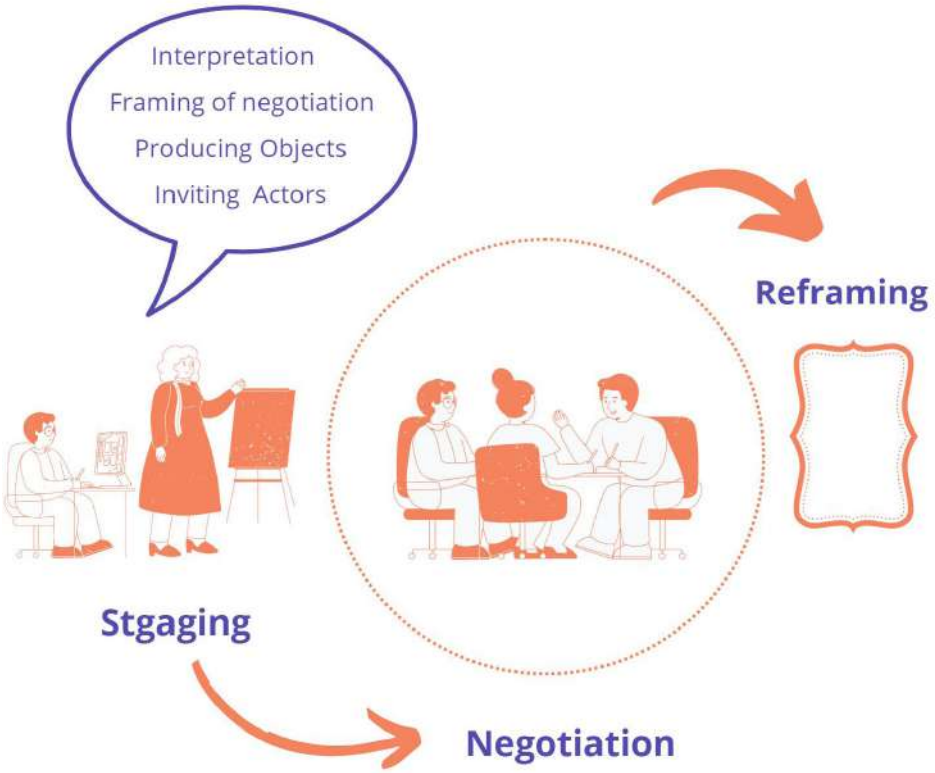

Figure 1: Illustration of Staging Moves, Inspired by Pedersen (2020)

3.3. Ethnographic Research

Ethnographic research provides deep insights into human behaviours and social relationships, providing a deep understanding of the challenges of various actors and identifying opportunities for intervention (Hansen, 2009). Methodologically, ethnographic research consists of 3 techniques: desk research, observations, and interviews.

These three techniques were essential in understanding the challenges of aging and interpreting and framing the problem statement for our project. Although our ethnographic work focused primarily on problem formulation, it also laid the foundation for the subsequent phases of the project.

The ethnographic research was mostly conducted in Portugal, which is our home country. Conducting the research in Portugal allowed us to overcome potential language barriers that could have compromised the quality and depth of the ethnographic work if it had been conducted in Denmark, since neither of us dominates the Danish language yet. Portugal is also where we have a bigger network, which allowed us to have a high response and acceptance rate for engagement.

Observation

Case Studies in Portugal:

Observation is a fundamental method for gathering data, and it offers numerous benefits to researchers. For instance, it makes it possible for researchers to gather information regarding emotional expressions, interpersonal interactions, and the amount of time spent on different activities (Balcom et al., 2021). To gather data for our research, we had the opportunity to observe for two days the daily routine of the residents and the staff at Centro de Bem-Estar de Bairro - a care home in Fatima, Portugal. We also observed the everyday lives of two families - Albertino's family and Mario's family, both currently facing challenges due to a family member's illness, and therefore, a loss of autonomy. We focused our observations on their way of coping with these life-changing events. Additionally, we observed their interactions with the people around them and their environment to determine whether these factors were harming or contributing to healthy ageing.

Semi-structured interviews

To complement our observation we conducted twenty semi-structured interviews as part of our empirical research (Figure 2). Semi-structured interviews are a verbal exchange where the interviewer seeks to obtain information from another person through questioning. While the interviewer has a set list of questions, conversations may proceed in a casual and improvised style, allowing participants to explore other topics that they consider relevant (Longhurst, 2003, p. 143).

These interviews aimed to gather insights from the field of gerontology, older adults, and formal and informal caregivers, to understand their experiences and challenges while ageing and caring, enriching our understanding of the field of ageing and healthy ageing. Three of the twenty interviews were used to validate the findings and proposed solutions (P16, 19, and 20).

The interviews and intended questions were planned in advance and served as guides for dialogue. Still, as suggested by Longhurst (2003), we let the conversations flow, which allowed participants to share their perspectives and concerns, contributing to our knowledge in the field and the present challenges. We audio-recorded the interviews using the IOS audio record app, after getting the consent of the participants, and later transcribed them with the help of TurboScribe and OtterAi (an online platform) for a thorough analysis.

Interview code	Name	Details	Extra details
P0	Dr. Sara	Technical Director at Centro de Bem-Estar de Bairro (Portugal)	Understand the main challenges that older adults experience in her opinion
P1	Yongjie Yon	Technical Officer on Ageing and Health at WHO – (Denmark)	Healthy Ageing and the Decade of Healthy Ageing
P2	Anna	Formal Caregiver – (Norway)	Challenges for older adults and caregivers in a care home
P3	Sara P.	Phisioteraphist – (Portugal)	Importance of keeping active to retard body decline
P4	Z.M. (M)	Care Home Resident – 61 years old (Portugal)	Moved to the care home due to incapacity, family is not available
P5	D. (M)	Care Home Resident – 97 years old (Portugal)	Moved because his children decided so. Still autonomous
P6	M.Z (F)	Care Home Resident – 100 years (Portugal)	Moved to the care home to be with her husband. Very autonomous, still showers alone
P7	Olinda	Albertino's wife – Informal caregiver – 85 years old (Portugal)	She shared the challenges of caring of caring for is husband with dementia
P8	G. (F)	Daily Occupant – 53 years old (Portugal)	Moved to the care home to 'treat' depression. Shared the good and the bad of living in a care home
P9	M. L. (F)	Daily Occupant – 88 years old (Portugal)	Goes daily there but is always anxious to go home, and refuses to participate in the activities.
P10	C. (M)	Resident – 68 years (Portugal)	Moved to the care home due to incapacity, family is not available
P11	M. (F)	Caregiver at the Care home (Portugal)	Mainly discussed the challenges of working at a care home
P12	CR. (F)	Caregiver at the Care home (Portugal)	Mainly discussed the challenges of working at a care home
P13	R. (F)	Caregiver at the Care home (Portugal)	Mainly discussed the challenges of working at a care home
P14	Pedro	Albertino's son – Informal caregiver (Portugal)	He shared the challenges of caring for a father with dementia
P15	Dr. Leonor	Psychologist – works with older adults in home care (Portugal)	Discussed ageism, the challenges of older adults, healthy and active aging, etc
P16	Diogo	Grandon of a person that goes to a Daily care home person (Portugal)	His grandmother goes to the daily center every day after family noticed her decline due to isolation
P17	Mario & Susana	Older Adults soon to be retired (Portugal)	They recognize planning for old age as very important but not so many do it
P18	Dr. Sara	Technical Director at Centro de Bem-Estar de Bairro (Portugal)	Validation of the empirical findings
P19	Dr. Leonor	Psychologist – works with older adults in home care (Portugal)	Validation of the empirical findings
P20	Dr. Sara	Technical Director at Centro de Bem-Estar de Bairro (Portugal)	A quick meeting to present the tool
P21	Dr. Claudia	Psychologist and director of another care home (Portugal)	Meeting to present the tool and the potential to promote at one of their events
P22	Dr. Leonor	Psychologist – works with older adults in home care (Portugal)	A quick meeting to present the tool. She said will test the game with her patients

Figure 2: Overview of all interviews performed during this project

Desk Research

Desk research was important for a comprehensive understanding of the problem statement and for focusing on specific topics relevant to our project. According to Snyder, 2019, “An effective and well conducted review as a research method creates a firm foundation for advancing knowledge and facilitating theory development” (Snyder, 2019, p. 333).

We reviewed the literature on ageing, definitions of healthy ageing and measures, and its connection to sustainable development goals. Later, we also conducted research on the importance of planning for ageing, and family involvement in planning. We have also researched examples of tools to help with initiating conversation on sensitive topics, co-design, and co-design methodologies, and the application of co-design in healthcare and ageing. We reviewed scientific articles, websites, and reports from sources such as the World Health Organization (WHO), the United Nations (UN), Decade of Healthy Ageing, The Gerontologist, BMC Public Health, Sustainability, and other relevant journals to extract reliable knowledge about these topics.

Besides helping us understand the problem, the desk research also provided important knowledge for the development of our solution tool.

3.4. Affinity Diagram

Affinity diagrams serve as invaluable tools for facilitating the organization, externalization, and comprehension of large volumes of unstructured qualitative data (Lucero, 2015). In this study, we used this method to structure and analyse our empirical data efficiently. We adapted the traditional approach of physical materials such as sticky notes and pens by using the online platform Miro.

First, we wrote online sticky notes with relevant information, reflections, significant facts, and quotes from interviews, observations, and desk research in Miro. Each interview, observation, and desk research had a different color, which allowed us to quickly identify the origin of the data, facilitating a more streamlined analysis process. Secondly, we looked for patterns and organized similar sticky notes into groups, representing different themes. Lastly, when each theme was identified, we looked for the ones that were more prominent and relevant to prioritize in the idea generation of our solution. This process led us to five major themes: lack of conversations about aging, decision-making influences on adaptation, the importance of autonomy, lack of planning, and the importance of family.

This approach was essential to ensuring that the identification of the problem and its corresponding solutions were grounded in concrete empirical evidence.

Additionally, we used this method for the feedback and observational notes that we gathered from the co-design sessions of the conversational tool, which helped with the evaluation and iteration of our prototype.

3.5. Intermediary objects

Intermediary objects are objects shaped to reflect the designer's framing of matters of concern and are essential in co-design sessions for negotiating ideas and concerns with other actors. These objects represent, translate, and mediate between various actors throughout the entire design process (Pedersen, 2020). Design specifications, prototypes, presentations, sketches, and feedback sheets, are examples of important intermediary objects that we used to facilitate stakeholder collaboration and communication during the co-design sessions.

During the interviews with care home residents and caregivers, we used a sketch of a *wheel of change* (Figure 3) as an intermediary object. The wheel of change is a circle with four quadrants. Each of the quadrants represents something that a person would like to create, preserve, accept or eliminate, in this case, in their current lives. The objective is that a person reflects on it and add a post-it to each of the quadrants. We used this game as a means of making the interviews more engaging and collecting data.

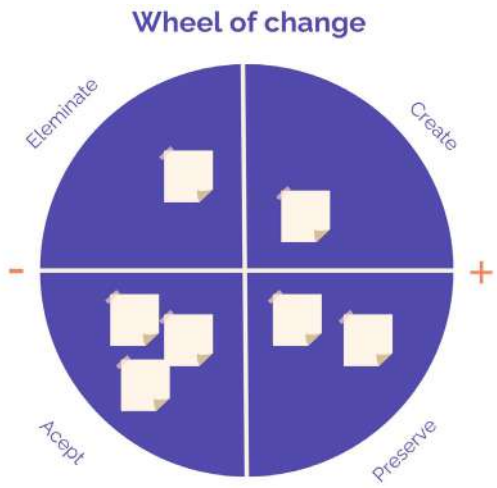

Figure 3: Sample of a wheel of change

(own illustration)

3.6. Prototyping

Prototyping is a key step in the co-design process. It entails building a quick mockup or model for testing a concept in a quick and economical manner (low fidelity). These prototypes can be created out of materials like paper or plasticine, as the main objective is to quickly get feedback from existing or new users, so that the concept can be improved or discarded before going too far into development (Blomkamp, 2018).

In this project, we created low-fidelity prototypes of our proposed game which allowed us to test different ideas in the backstage and frontstage. These were first created by sketching on paper and then using Miro printed on normal paper to test with potential users the basic mechanics of the game and collect initial reactions from actors. These low-cost prototypes were tested and iterated based on feedback from co-design sessions, gradually improving the game's design and functionality.

3.7. Double Diamond

When designers embark on a project in a complex field, structuring the work and the design process can be highly beneficial. For this project, we drew inspiration from the Double Diamond model (Design Council, 2024) to guide our work flow (See Figure 4).

The Double Diamond model divides the process into distinct phases, alternating between diverging and converging approaches to gather and refine knowledge. These phases are: Discover, Define, Develop, and Deliver.

Discover

"The first diamond helps people understand, rather than simply assume, what the problem is" (Design Council, 2024). Through desk research, observations, and interviews, we explore many aspects, such as aging, healthy aging, SDGs, and challenges faced by older adults and their families. This research investigation led us to understand the problem.

Define

In this phase, we analysed and synthesized empirical insights to define a clear direction for the project. By using affinity diagram, we mapped and structured our collected data, identifying key problem areas such as lack of communication about aging and planning, decision-making influences on adaptation to life changes, the importance of autonomy, and family involvement. These findings led us to the problem definition.

Develop

This phase involved exploring potential solutions through idea generation based on earlier findings and new insights. In this phase, we brainstormed ideas that would address our problem definition, which led us to the development of different prototypes and sketches. We also used this phase to stage our co-design sessions with potential users. After each session, we kept iterating the prototype according to feedback.

Deliver

In the final convergent phase, we aimed to finalize the tool and test it. In this phase, we introduced our final solution to a family during a blind playtest session to understand the viability of distributing the game to more people, without our facilitation.

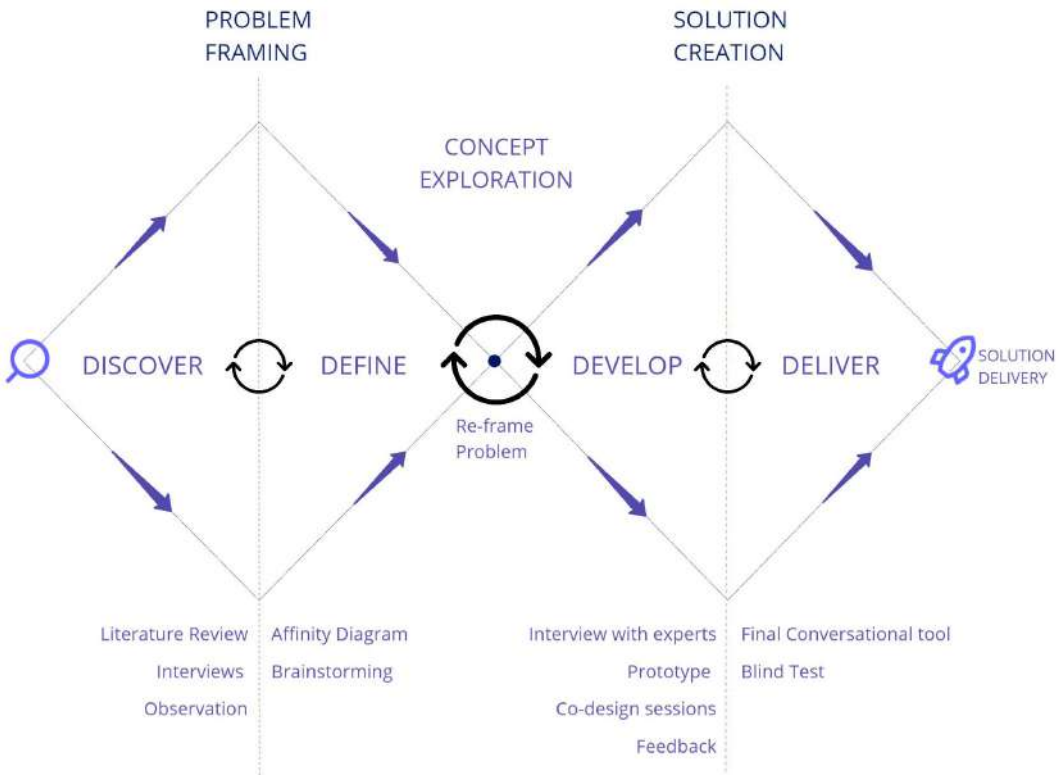

Figure 4. The Double Diamond model for design processes (own illustration)

Tools for verification, transcription, and translation of text

ChatGPT and Grammarly were used in our project for the verification of text to ensure the clarity, coherence, and grammatical accuracy of the content. It was not used to generate new text but rather to refine and improve the text that we generated.

Turboscribe and Otter.ai were used to transcribe audio files from our interviews and co-design sessions. While these transcriptions were not always accurate, it allowed us to quickly skim through text, start our coding process, and then verify the audio by following the timestamps.

We also used ChatGPT and Google Translate for translating text between Portuguese and English. While this method helped speed the process while maintaining the accuracy and contextual integrity of the original content, we still used our personal language skills for more accurate translations.

The use of these tools is in accordance with the specified guidelines for permissible aids.

4

EMPIRICAL RESEARCH

4. Empirical Research

In this chapter, we first discuss the interview we had with the technical officer on ageing and health at WHO/Europe, which enriched our knowledge on the topic of healthy ageing. We also briefly introduce each of our research case studies, and then analyse the ethnographic research findings. Lastly, we will interpret and frame the problem. This is defined as the *Discover* phase in the double diamond.

4.1. Interview with Technical Officer at WHO

To enhance our knowledge on healthy ageing, we interviewed the Technical Officer on Ageing and Health at WHO/Europe in Denmark. We aimed to gather valuable insights and expertise from a leading figure in the field. For this interview, we extensively studied healthy ageing and prepared a semi-structured interview.

In the interview, he touched on many interesting points, many of which we kept in mind until the end of the project:

He emphasized the broad concept of healthy ageing, introduced globally in the 2015 World Report on Ageing and Health. He stated, “The concept of healthy ageing really looks at the whole life course perspective”. He explained that while ageing is often defined as beginning at 60, how we age depends significantly on various factors, not just genetics, but also on the impacts of the environment and lifestyle.

The director also addressed the critical issue of ageism, “the way we talk about age and ageing really influences everything”, emphasizing that language and social attitudes significantly impact the well-being of older people.

“We generally don’t use the word elderly, at least in the English language, because elderly implies frailty and weakness, but not all older people are like that. So we generally use the word older people, older adults and older persons. But of course, different languages have different meaning”, he explained. This shift in language is part of a broader effort to change negative perceptions of ageing.

He also emphasized the importance of intergenerational activities and education to promote respect and understanding between all age groups. He mentioned ongoing initiatives to get young people talking about ageing and emphasized that everyone experiences ageing. As he said, “ageing is a lifelong process that begins at birth”. This perspective encourages a holistic view of health and well-being throughout the life cycle, emphasizing the importance of healthy behaviour from a young age to ensure a better quality of life in old age.

When it comes to planning for healthy ageing, he expressed his vision for an era that respects individual autonomy and supports the functional capabilities of older adults. He shared his vision for age-friendly services where health and care professionals encourage older people to maintain their independence, rather than doing everything for them. “We need to promote their skills and recognize their performance,” he said.

He concluded by stressing the need to change the narrative around ageing: “we don’t want to talk about ageing, we don’t want to talk about illness, sickness, or death, or palliative care. Because we don’t want to think about this. But that’s the reality. So I think the idea of how we change the narrative, how we talk about ageing, and ageing, how we think, feel and act on ageing is very important.”

4.2. Case Studies in Portugal

Centro de Bem-Estar de Bairro

For our research we were allowed to observe and interview both residents and caregivers at a care home in Portugal called Centro de Bem-Estar de Bairro in Fatima.

Our approach to understanding the experiences of residents involved semi-structured interviews and the utilization of a design game, the “Wheel of Change”. This allowed us to facilitate discussions around the negative and positive aspects of their lives that they wished to address or accept.

The task of inviting residents of the care home to participate in our research was delegated to an important actor, the director of the care home since she was the one who knew all the residents and knew which ones were the ones indicated to talk with us. The director was also in charge of inviting the caregivers for a workshop.

Figure 5. Photo of an interview at Centro de Bem-Estar de Bairro

In total, we interviewed 4 full-time residents and 2 of the daily centre, with age ranging from 53 to 100 years old, on two different afternoons. We started with introductory questions to get to know them, how their lives were before coming to this institution, and why they came here. Then we asked questions to learn about their daily routines and activities and asked them to think about the positive and negative aspects of their current lives. This is where we introduced the wheel of change. We then finished with more open questions, such as what healthy ageing meant to them and what advice they would give to younger generations to age well. In our initial interviews, we chose to use pen and paper to take notes. However, we quickly realized that whenever we tried to document their responses, interviewees became defensive. They would pause and

rethink before saying something, and sometimes even seemed to modify their statements to avoid sounding critical. Recognizing this could be a barrier to an open conversation, we decided to change our approach. We chose to focus entirely on the dialogue, simply being present without the distraction of note-taking. Instead, we recorded conversations and revisited them later to take notes. For more details about this care home check Appendix 1.

Case Study: Older Person with Dementia and his Informal Caregivers

This case study examines the daily routine of a family who struggles with caring for an older person. Albertino, a 90-year-old man, began showing signs of confusion, and a month later, he was diagnosed with dementia. In March 2024, five months after his diagnosis, we visited Albetino's house, where he lives with his wife Olinda, who is 85 years old.

We were surprised to see that the house had all the doors and windows closed - a decision taken by his wife and his children after he had left home a few times and gotten lost and fallen.

Besides observing, we also interviewed his wife and son, who are now his informal caregivers. During our interview with his wife (P7), she reflected on how their lives have undergone significant changes, with both experiencing a loss of autonomy since her husband's disease. Albertino's health condition restricted his once-active lifestyle. For more details about the case study check Appendix 6.

Case study: Older Person Prepared for After Death

This case study examines the challenges faced by Mario, a 91 year old who experienced severe health issues, including hospitalization and the need for a pacemaker, and the challenges his family faced. Unable to return home after his hospital stay, Mario lost his autonomy and independence and had to move in with his son. This was a difficult period for both, and for all other relatives around them. He had a hard time adjusting to his new dependency situation, and the family had to adjust their routine to accommodate his needs. Despite having planned for his death, Mario had not discussed his care preferences for his later years with his family. For more details about this case study check Appendix 9.

4.3. Key Findings (Interpretation)

Following our ethnographic research, we transcribed all interviews and organized and synthesized all our insights from the observations using the affinity diagram method, in Miro, and moved to the *Define* phase of the double diamond. Patterns were found and grouped, ultimately leading to the following key findings.

Difficulty in Having Conversations About Ageing

The widespread difficulty in initiating and sustaining conversations about ageing is one of the most important findings in this research. This challenge affects how individuals and families approach ageing. Many

participants of this research expressed challenges in initiating discussions about ageing-related topics, including preferences for later life conditions and end-of-life care, similarly, this is also seen in literature, e.g. in Festvåg et al., (2024) article. This difficulty often stemmed from cultural taboos surrounding aging, as well as discomfort with acknowledging one's own mortality, as noted by Dr. Leonor and Dr. Sara. They mentioned death being perceived as more acceptable than discussing aging itself, reflecting broader societal attitudes towards ageing as a sensitive or uncomfortable topic. In the interview with the director of WHO he also mentioned this difficulty (see page 28).

Dr. Sara notes the need for early discussions and planning to prevent last-minute decisions under stressful conditions. She adds: "We never talk about this, nobody likes to talk about it. It's a process of becoming aware that you are losing faculties, and that is not easy to admit." (Appendix 15)

The case of Albertino, a 90-year-old man with dementia, exemplifies this challenge. His family did not engage in meaningful discussions about his preferences for care as he aged. This lack of communication became apparent when Albertino's condition deteriorated rapidly due to dementia, and his family had to make urgent decisions about his care. His family's decisions, such as modifying the home for safety and sharing care-giving responsibilities, were reactive rather than proactive. This reactive approach caused significant stress and disruption to family routines, as detailed in their efforts to prevent him from wandering and getting lost.

Mario's case also exemplifies the lack of conversations about ageing within families. Despite his advanced age (91 years old), discussions about his future care needs and preferences were overlooked until he became ill and dependent. This lack of proactive communication hindered the family's ability to adequately prepare for and address the challenges that come with ageing.

These two cases highlight the importance of early and open conversations about ageing. These discussions should encompass potential health changes, preferred living arrangements, and care preferences. By addressing these topics early, families can better prepare for the inevitable transitions associated with ageing, reduce stress, and ensuring that the older adult's preferences are respected.

The ethnographic work at the Centro de Bem-Estar de Bairro also brought to light this difficulty. The residents at the care home expressed nostalgia for their past lives. They talked a lot about their families and their work, which they considered to be the most important part of their lives but have not talked about what they have done after stopping working and how they lived their lives just before their institutionalisation. We learned that many of them struggled with the transition from working life to retirement, as they see this as being old and fragile and not worthy (P5,P6,P9). They tend to shy away from social interactions because they believe that society devalues them. They believe that due to their age, their presence or participation in to activities would not be worthy "Why do activities? To do them wrong" (P9).

Dr. Leonor and the director of WHO advocate for a cultural shift that normalizes discussions about ageing.

Lack Of Planning And Knowledge Regarding Healthy Ageing

We found in our ethnographic research that there is still a lack in planning and preparing for ageing and knowledge about healthy ageing. This gap in knowledge results in inadequate planning and poor decisions as health declines or other age-related challenges emerge.

The case of Albertino provides an illustration of this general issue. Despite Albertino's father having experienced the same condition (dementia), he and his family never engaged in discussions or explored options together. Now, the responsibility lies with the immediate family to make decisions regarding his care. His disease has had a considerable impact on his family, who play an important role in his informal care. This impact on both Albertino and his family is also reflected in the research of (Jiang et al., 2024), that argue that dementia can significantly affect both patients and their caregivers, seriously impacting their quality of life (Jiang et al., 2024).

Mario's story also highlights the consequences of inadequate planning for ageing. Despite his preparations for death, such as arranging his funeral details, he had not considered the possibility of needing long-term care. This lack of foresight resulted in a crisis when he was no longer able to live independently. His family, unprepared for the level of care he required, faced significant challenges in providing the necessary support.

Similar to the case studies, interviews with P4, P5, P7, P8, and P9 at the Centro de Bem-Estar de Bairro revealed that they had not prepared for ageing or planned for their care when they lost independence, leaving their families to make decisions on their behalf.

In contrast to those two cases above, there is the case of Diogo's grandmother, which demonstrates the positive impact of proactive planning and intervention in promoting healthy ageing. By initiating discussions and exploring care options early on, her family successfully improved her overall well-being and delayed the need for full-time institutional care. This highlights the importance of early engagement in care planning to address the challenges associated with ageing effectively. However, it would have been even more beneficial if this had been planned just after or even before closing the cafe, so she would not have experienced that episodic decline.

In the interview with Dr. Sara, she gave the example of unexpected health events often leading to unprepared transitions to care facilities, highlighting the critical need for proactive planning in addressing future care needs. She also stressed the importance of well-planned life for after retirement, noting the necessity for psychological preparation to manage one's time during this life stage effectively.

Moreover, Sara mentioned that individuals who plan ahead for ageing and, for example, their future care needs often experience better adaptation to care homes, indicating the benefits of proactive decision-making in ensuring a smoother transition to long-term care facilities. She also noted that some individuals take preventive measures by registering in nursing homes in advance to secure a place when needed, underscoring the proactive approaches some individuals could adopt to address potential challenges in accessing care facilities, however, this rarely happens in her experience.

Although we noticed this lack of planning for ageing, the literature supports the benefits of preparation for age-related changes, emphasizing

its role in increasing the quality of life and well-being in later years (Azizi et al., 2016; Kornadt et al., 2019; Solhi et al., 2022a; Solhi et al., 2022b). Making thoughtful plans for the future is essential to ensuring a smooth transition into later life (Solhi et al., 2022a).

Influence of Decision-Making on Adaptation to Life Changes

Our study also demonstrated the crucial role that decision-making plays in influencing how older adults adjust to major life transitions associated with ageing, such as moving into a care home.

Our interviews with residents at Centro de Bem-Estar de Bairro provided insights into the important role that decision-making plays in helping older adults adjust to changes in their lives, especially when those changes mean move to a care home. The centenarian resident's case (P6) serves as an example of how individual agency and decision-making can have a beneficial effect on adaptability. Despite residing in a care home, she made the proactive decision to move there herself years earlier due to her inability to care for her husband. This choice allowed her to maintain a feeling of autonomy and contentment, even after her husband passed away. This highlights the importance of empowering older people to make decisions about their living conditions, as this can significantly influence their well-being and sense of control over their lives.

The difficulties that result when family members or caregivers make decisions without taking the old person's preferences into account are highlighted by P9, a woman that frequents the daily centre, who refuses to participate in activities and expresses her wish to return home early day. P9's son's decision to keep her in the care facility, in spite of her resistance, illustrates the power dynamics at play in decision-making and how they affect the ability to older adults to adapt. This emphasizes how crucial it is to involve old adults in decision-making in order to preserve their autonomy and preferences and promote a more seamless transition to new circumstances.

Dr. Sara noted that some residents proactively choose to enrol in the care home before they require acute care, which facilitates an easier transition: "There are people who register preventively, saying that if they ever need care, they want to come here". () Highlighting that when this happens, when they move because was their choice their adaptation is much better and also makes the work of the caregivers much easier.

Dr. Leonor, added that a smooth adaptation to a care home depends on who made the decision: "One question is, I want to go a care home because I don't want to be a burden. Another thing is, you're going to a care home! The way decision-making is made greatly influences the way they then carry out the process of adapting to the care home." (P.) .

As noted by Nolan & Dellasega (2000), "Entry to nursing home care is one of life's major transitions, and for many older people, it may be the last significant decision they make." (Nolan & Dellasega, 2000) It is imperative that such transitions afford older individuals the opportunity to assess and ensure that the new living arrangement aligns with their needs, interests, and personal preferences for a better adaptation.

Importance of Maintaining Autonomy

The importance of maintaining autonomy emerged as a central theme in the participants' narratives. Older adults expressed a strong desire to maintain independence and decision-making authority over their lives, even in the face of declining health or cognitive abilities.

Autonomy is a fundamental aspect of healthy ageing, yet it is often compromised in older adults, particularly those with dementia. D. Olinda's experience caring for her husband Albertino highlights the impact of loss of autonomy on both the individual and their caregiver. As Albertino's condition progressed, D. Olinda's freedom and lifestyle were significantly restricted, leading to physical and emotional exhaustion.

In the case of Mario, his loss of autonomy due to a weak body significantly impacted his well-being and his quality of life. As his mobile abilities declined, he became increasingly dependent on others for support and assistance, leading to feelings of frustration, dependence, and loss of identity. This highlights the profound impact of autonomy on the psychological and emotional well-being of older people.

At the Centro de Bem-Estar de Bairro, the centenarian resident (P6) shared that even though she is there, she is still a very autonomous person, she takes care of her hygiene on her own, and she does some exercise in the morning, demonstrating to us how she does during the interview. Even though she is at the care home, she feels she still has some autonomy, what she appreciates. This importance of autonomy was also highlighted by other residents (P4, P5). "Going to the cafe when I want. Last time I said I would come back at 12 but it was past that when I came back and no one said anything to me" (P4). "Fortunately I can still dress myself, put my shoes on, I can still do that, but when I no longer can..." he references asking someone to kill him (P5).

Dr. Sara noted in the interview that individuals often face the challenge of losing independence, which can be difficult to accept and lead to depression: "Realizing that they can no longer do things they used to do, like moving around independently, is a tough and depressive process for the older adults." (Sara)

In the interview with Dr.Leonor she emphasizes that autonomy is not just about physical independence but also about having control over one's environment and decisions. She suggests that care homes should prioritize resident autonomy by involving them in daily routines and decisions about their care, this was also highlighted by the director of WHO (). This approach can enhance their sense of dignity and improve their overall quality of life.

The Importance of Family

All of the cases we researched demonstrate the importance that the family has on an older person. In Albertino's case, his family is doing their best to manage his illness. As previously mentioned, they are sacrificing their routines to accommodate him. They believe that, even though he spends his days confined at home, this is what he would prefer. In an interview, Albertino's wife mentioned that family is what brings her the most joy in life, she appreciates that everyone gets along well and care for her.

Mario's family also played an important role when he could no longer

live independently. Although he wanted someone by his side 24 hours a day, which was not possible, his family did their best to ensure he had the support and care necessary during this period of his life.

In the interview with Diogo he shared that, recognizing his grandmother's declining health and social isolation, his family took an active role in encouraging his grandmother to participate in activities at a day center, which improved her overall well-being considerably. They took proactive action, talking to her about the advantages of participating in these kinds of activities and stressing how continuing to do so could stop her decline from getting worse. This proactive strategy highlights the important role that the family plays in the life of older adults, both starting the conversation about ageing and actively looking for ways to enhance the quality of life for loved ones.

Similarly, the history of P8 at the Centro de Bem-Estar de Bairro also reflects the importance of family involvement. Despite her being only 53 years old, P8's daughters, who were studying abroad, were concerned about her well-being due to her depression and isolation at home. They took proactive steps to arrange for her care. They asked that their mother move to a care home, ultimately leading to her improved condition and increased participation in daily activities. This too highlights the critical role of family involvement in taking steps to resolve health issues and improve the well-being of their loved ones.

P5 expressed a desire for more frequent visits from his children, emphasizing the significance of family connections in their well-being.

Similarly, P10 fondly recalled past family gatherings and outings, highlighting the positive impact of familial interactions on their overall happiness and satisfaction.

Recognizing the importance of family for the older adults in the care home setting, Dr. Sara mentioned that they, at the care home, strive to involve the community and families in its activities to create a supportive environment that is beneficial to adaptation and well-being of residents. However, she emphasizes that family involvement varies greatly between families, with some being highly involved while others rarely visiting. "There are children who only want the problem solved and then rarely visit their parents."

Dr. Leonor in the interview affirmed that family calling regularly is believed to have a positive impact on the acceptance of being in a care home: "I have a lady whose son couldn't take care of her, and she accepted going to the care home very well. But the son calls every day. And that's another reality, isn't it?" (Dr.Leonor)

In the literature, family relationships are also recognized as important for the physical and emotional well-being of older adults (Carr & Utz, 2020).

In short, families play a crucial role in the overall well-being of an older adult. Families can help older adults maintain their autonomy, they can take the lead in starting conversations about ageing, help with planning, and ensure that loved ones' wishes are fulfilled, especially when older people cannot express them in the future, honouring the preferences of their loved ones.

Conclusion of Key Findings

These findings show that the way we experience ageing is influenced by our personal experiences, family relationships and society's views on ageing and care. It is often difficult to talk about ageing, which shows that we need to facilitate these conversations, encourage open discussions and offer support to individuals and families.

Making decisions is very important in shaping how we age and adapt to changes in life. We need to value the autonomy of an older adult, respect individual preferences, and ensure that decision-making includes everyone involved.

The lack of planning and knowledge about healthy ageing highlights the need for comprehensive education and support services designed to empower older adults and their families to make informed decisions about ageing-related services and care.

4.4. From Findings to Project Objectives

Through a brainstorming session between us two, we defined the project objectives that are aligned with the key findings mentioned in the section above. These objectives, which are outlined below, served as our guidance while conceptualizing and developing a solution.

Stimulate dialogue

Although people do not often talk about ageing, experts (WHO's director, and psychologist) expressed the importance of talking about this topic.

The solution should be able to create a "proper" environment to encourage dialogue and acceptance of the ageing process as a natural process of life, fostering emotional resilience. By promoting frequent discussions, we hope that stereotypes about ageing will begin to change. According to research, negative stereotypes about ageing represent a significant barrier to achieving healthy ageing outcomes (Solhi et al., 2022a). We also hope that attitudes towards ageing will become more positive, since positive attitude about ageing can significantly impact the psychological well-being of older adults, promoting higher levels of contentment and decreased levels of anxiety and depression (Bryant et al., 2012).

Empower decision making

We have also discovered that decision-making influences adaptation to life changes, so we need to respect the agency of older adults. The solution should empower people to express their intentions as they age. It is important that they can have a say on their preferences as they age, preferences on what kind of activities they want to perform, and what modifications they prioritize if they decide to "age in place," preferences if they ever become dependent, and so on.

Support Planning for Healthy Ageing

Although we noticed this lack of planning for ageing, the literature reveals its' importance (see page: X). So it is of the utmost importance that the solution promotes a proactive planning.

Besides the importance of planning, studies also emphasize the importance that healthy lifestyle choices. Eating a balanced diet and exercising frequently, are beneficial for supporting both physical and mental well-being as one ages (Hörder et al., 2013; Pothisiri & Quashie, 2018). Adding to this, Gil-Lacruz (2019) argues that low participation in social activities, as well as living alone, increases the risk of health problems in ageing, such as disability, fatigue, etc. (Gil-Lacruz et al., 2019). The solution should promote healthy lifestyle practices and social engagement and create awareness of the impact of different habits and choices on ageing and overall health and well-being.

Prolong Autonomy

From the interviews, we understand that losing autonomy means losing identity for many people. Although it is very complex, the solution should provide individuals with the necessary tools e.g. educational, to prolong their autonomy. In particular, adopting healthy lifestyles is of utmost importance given the evidence linking health status to mobility and independence, so people need to be informed about this. Furthermore, promoting open dialogue between family members has the potential to increase the likelihood of family support and respect for individual preferences, helping them to maintain their autonomy as much as possible.

Involve Families

The last finding shows how family plays an important role in the well-being of older adults, so the solution should promote family engagement and participation in the ageing process of each person.

4.5. Framing the Research Question

Taking all of this into consideration, a solution should promote healthy ageing by stimulating dialogue, empowering decision-making, and supporting planning with families to ensure that autonomy and overall well-being are maintained for as long as possible.

This led us to our research question:

How to co-design a tool that encourages families to initiate conversations and personalized planning for healthy ageing?

5

SOLUTION SPACE

5. Solution Space

Here, we shift our attention from the key findings of our research towards envisioning potential solutions. Based on the Double Diamond framework, this is where we move to the *Develop* stage by expanding and refining the solution space through several iterative co-design sessions. By utilizing the Staging Negotiation Spaces (SNS) framework, we aim to facilitate network alignment and foster sustainable innovation through strategic staging, configuration, and facilitation of negotiation spaces among various actors (Pedersen, 2020). This chapter outlines our design strategy, objectives, prototyping and staging process, feedback gatherings and iterations, and final testing to develop the proposed solution. Co-design sessions focused on discovering new matters of concern and facilitated negotiations among actors. Co-designers provided insights and feedback, which were used to make adjustments and enhancements to better reflect their experiences and needs. The iterative process involved continuous improvement of the low-fidelity game prototype.

5.1. Staging: From the Backstage

Conceptualization (Framing the solution)

Brainstorming and Idea Generation

Based on the key findings discussed in the previous chapter, we initiated a series of brainstorming sessions to generate and document as many ideas as possible. Our brainstorms focused around key questions: How can a solution stimulate dialogue, empower decision-making, support planning, promote healthy ageing initiatives to help prolong autonomy and overall well-being, autonomy the longest, and have families involved? These sessions included rapid ideation, where we both wrote down words and phrases describing ideas and scenarios, and sketching journeys that an older adult and their families might take, from initiating discussions about ageing, to planning for healthy years at an older age.

Our ideas were also shared and discussed with Dr. Sara, the care home director. Through Miro's platform, we presented our findings, then shared our initial ideas, which she validated:

> *"Retirement should be well planned... before actually entering the retirement process, I believe people should have psychological preparation to manage their time effectively. This is to avoid falling into habits like procrastination or staying at home all day." (P16)*

We did the same with Dr. Leonor. Once we explained our findings, she agreed that these were very important areas to explore. We briefly mentioned the idea of involving games as a way to facilitate conversations to which she agreed as being a good tool and that they often try to do the same with their patients, making things more tangible to stimulate reflections and discussions. This led her to share a game that she has been developing with her colleague, to raise awareness of domestic violence in old age, highlighting that a game for our solution may also be a good option.

She also demonstrated interest in participating in the co-design of the conversational tool, by contributing with her knowledge and experience in the field, once we had a more concrete concept in place.

Initial concept: A vision derived from empirical material

Recognizing the complexities inherent in discussing future vulnerabilities and planning for life beyond retirement, we concluded that the solution should be a process involving different phases.

The zz is a conversational game that serves as a catalyst for initiating meaningful conversations about the future and shedding light on the diverse range of care options available for individuals facing different circumstances. We understand that initiating these conversations can be difficult, therefore, the game should be engaging and avoid having the feeling of being in an interview. The overarching goal of our game is to foster a deeper understanding among players regarding each other's preferences and priorities in various life scenarios. By engaging in these conversations, participants can gain valuable insights that will inform their plans for the later stages of life. Upon completion of the game, participants should be encouraged to visit a dedicated website, where they can take the next steps in their journey (phase two, three, and four).

Phase two is where the participant joins an online platform to create a personalized profile based on their responses during the game. This profile serves as a foundation for further exploration and decision-making.

In phase three, the platform directs these new users to personalized resources and guides based on their profile, to facilitate their search and exploration of a wide array of ageing solutions, advice, and initiatives available to them. This could be for example, finding care homes near by or a financial establishment to book an appointment. This phase empowers individuals to make informed choices that align with their values and aspirations.

After the reflection period, phase four is where the platform encourages users to update their profiles, incorporating any new insights or decisions they have made. They would also have the opportunity to share details with family members or trusted individuals, facilitating open communication and support networks. They could also set reminders to update their profile every year and to track the progress of their goals.

In essence, our game and accompanying platform aim to empower individuals to start thinking about and proactively planning for their future, ensuring they can act with dignity, autonomy, and peace of mind as they age.

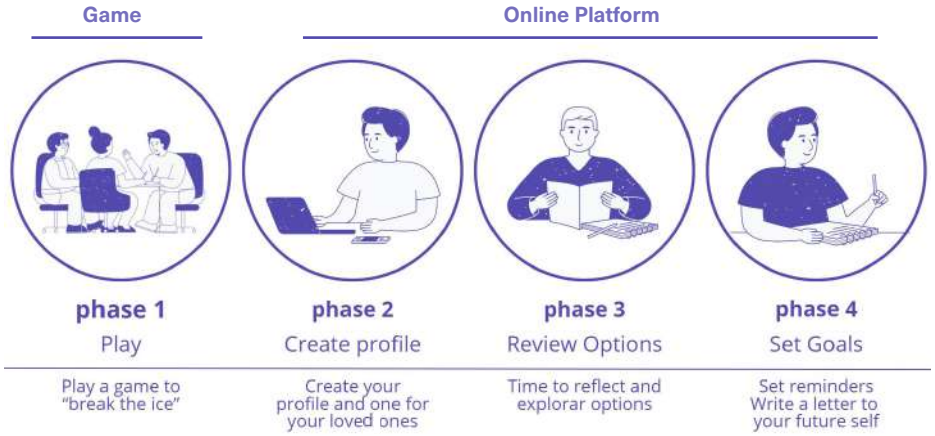

Figure 6: Our concept of a potential solution

At the time of this report, we placed greater focus on the game as it is the first phase of our proposed solution, nonetheless, the remaining three phases of this concept were loosely discussed at the conclusion of each co-design session.

Producing Objects for the Co-Design Sessions

Design Specification

An important intermediary object that translated the insights from the affinity diagram into a clear and useful depiction of the empirical data collected from interviews, case studies, and fieldwork was the design specification (Figure 7). This process involved re-framing findings into requirements and desirable features for the future solution. The design specification was instrumental in the creation, negotiation, and selection of concepts during various brainstorming sessions. It was intended to be dynamic, evolving regularly based on new information and insights from both backstage and frontstage activities.

Design Specification	
Easy and accessible	Simple for all ages and abilities
Engaging	Encourages meaningful conversations among all participants.
Inclusive	The game must alternate between each player
Empowering	Making sure older people are part of decisions
Relevant and informative	Deals with real-life potential ageing scenarios and existing healthy ageing initiatives
Kind	Handles sensitive topics gently
Guiding	Offers help for tricky discussions
Fun	Provides an enjoyable experience for players
Target audience.	It should be targeted to families, more likely with older adults at an age near retirement to play with their loved ones
Limit	Have a minimum and maximum number of players to ensure a good level of engagement among all.

Figure 7: Design specification for our project

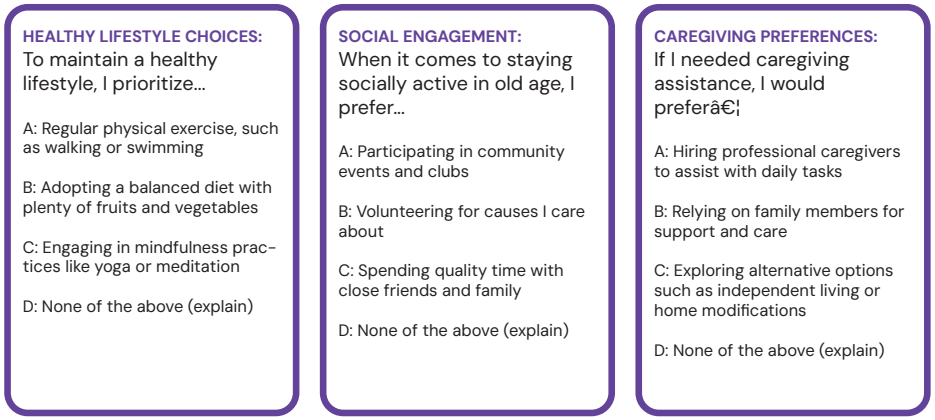

Figure 8: Prototype design of the dialogue cards

Prototyping: A Conversational Game

The prototype of the conversational game was the central element of our sessions, serving as an intermediary object to gain new insights and learn from each other's concerns, while also discovering the viability of the game for assisting families in their journey towards healthy ageing.

The main components of the game prototype included dialogue cards and healthy ageing cards. The dialogue cards (Figure 8) presented life scenarios designed to encourage players to think about their futures. These scenarios covered topics such as preferred activities, housing preferences, healthcare needs, and lifestyle goals. Each scenario included three different answers, allowing players to choose which option they prioritized.

Healthy ageing cards described examples of initiatives that promote healthy ageing (Figure 9). These cards were meant to be informative, so people are aware of best habits and practices to achieve a healthier life.

Additional materials and game variations were prepared to be tested and discussed during co-design sessions, encouraging actors to consider different playing mechanisms and inviting them to sketch or write down their ideas for improvements. These included a board with a path, rules, character pieces, tokens, and additional cards called “bad luck” which describe unlucky life situations (meant to deduct points from players but also inform them of these life changing situations), and note pads for writing down answers and points. All materials were created at a low-fidelity stage, using printed paper. We also developed an online version using playingcards.io, which enabled us to replicate the setup and playability of an in-person session, thus allowing us to perform co-design sessions online as well.

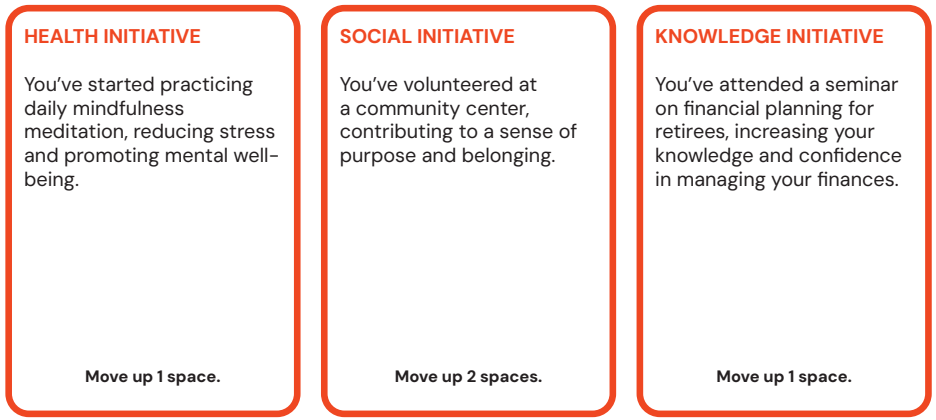

Figure 9: Prototype design of the healthy ageing cards

Inviting relevant actors

For our co-design sessions, we sought a diverse range of participants, including direct potential users (families) and other stakeholders (experts) who were available and willing to participate. We reached out to both our network (including family and friends) and external contacts. Unfortunately, external participants were either unavailable or did not respond in time for this first round.

To engage participants, we explained that the sessions focused on “healthy ageing” and invited them to help test and co-create a game solution during a one to two hour session. Some were initially hesitant, concerned that their feedback might not be relevant or that they would not know what to contribute. We assured them that all feedback was valuable, emphasizing that we wanted to learn from their experiences and opinions and that there were no right or wrong answers. This reassurance, along with the provision of snacks and drinks during in-person sessions, successfully convinced them to participate.

The participants in the first round of co-design sessions included Mario and Susana, a Portuguese couple. In the second session, we had the participation of Matilde, a Portuguese sustainable design engineer whose parents are retired. Finally, in the third session, a family of four comprising António, Maria, Tiffany, and William (Figure 10). William, being one of the authors of this project, acted both as a co-designer with his relatives and as a facilitator. Both of us assumed the role of facilitators in all sessions.

The advantage of enrolling the above actors in the design process is that the game becomes inscribed with their expertise and concerns, which ensures quality and relevance for our future users and collaborators. Simultaneously, this will pique their interest, making them more likely to adopt and promote the final game when it becomes available.

First section	Second session	Third session (online)
Mario – 62 years old	Matilde – 32 years old	Antonio – 60 years old (Father)
Susana – 55 years old		Maria – 58 years old (Mother)
		Tiffany – 36 years old (Daugther)
		William – 32 years old (son)

Figure 10: Name and age of participants per session

5.2. Co-design Negotiations: At the Frontstage

Co-design sessions served as a shared environment between all actors (facilitators and co-designers) to test and co-create a solution by promoting open conversations, exchanging ideas, investigating concepts, navigating through each other's points of view, and building on concepts.

The structure of the co-design sessions

Our co-design sessions were divided into four parts: (1) introduction to the topic and game, (2) playing the game, (3) feedback about the game, and (4) brainstorm, where we discussed potential improvements to the game, new solutions, and ideas for next steps and how to take action towards planning.

To introduce the topic, we had prepared a short slide-show presentation that shared the different challenges related to aging and then showcased our empirical key findings. This ensures that everyone has the same knowledge.

To gather feedback, we prepared a sheet divided into six sections, each with a question or request for each actor to fill in (Figure 11). They wrote their answers on post-its and placed them below each question, while we followed up with additional questions.

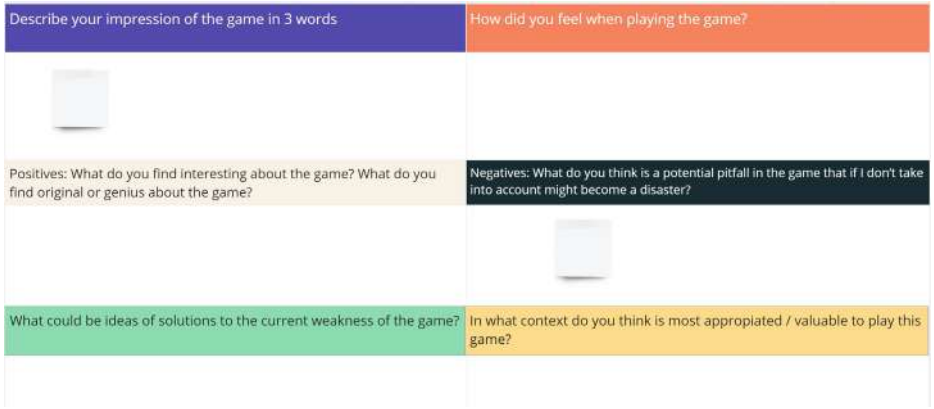

Figure 11: Feedback sheet used to gain knowledge from co-designers during and after sessions

The first two sessions were conducted in-person using a prepared card game setup at a dinner table, however, due to the geographical dispersion of the last group (family of four), we conducted that session online. This allowed us to accommodate all relevant actors, regardless of their location. The online session was conducted using Microsoft Teams for video calls and screen sharing, Miro for idea generation and feedback, and playingcards.io for the game setup.

During the co-design sessions we aimed at testing two types of playing modes, one where players win by getting the most points, and another where they use a board to move up spaces until reaching a certain point. In general, the rules followed this simple structure:

One player begins by drawing a dialogue card containing a statement and three possible answers: A, B, or C. They read the statement aloud, and the other players attempt to guess the answer the reader would choose, by writing down the answer on a provided piece of paper. They should also write down what answer they would choose for themselves. Once everyone indicates they are ready, each player reveals their what answer they guessed. The reader then discloses their actual answer, and whoever guessed it right, earns a point. Before concluding the round, the reader selects someone, and tries to guess their answer as well. If the guess is correct, the reader earns the chance to draw a "Healthy Ageing" card, which may grant them 1 or 2 additional points—details about these points are provided at the bottom of each card. If the guesser is unable to correctly predict the chosen person's answer, they will lose the opportunity to obtain a healthy ageing card and the extra points. The turn then passes to the player on the left (players draw cards clockwise), who repeats the process.

What We Observed

During all co-design sessions, we observed a high level of engagement and curiosity especially when players drew the dialogue cards and read the statement. They frequently expressed interest in each other's responses, often asking follow up questions, leading to a deeper understanding of their preferences and thoughts on ageing. Matilde, who participated alone with us in the second session, kept wondering what her mother's answer would be. She realized that she did not know her mother's preferences and goals because they had never talked about these topics before, highlighting the game's potential to bridge communication gaps within families. With the family in the third session, the answers to the dialogue cards often led to surprising revelations, such as the parent's preference for a retirement community over living with family and the choice of activities to maintain cognitive and physical abilities. This surprise underscored the importance of having these conversations, as assumptions about preferences were challenged. Many of the statements from the dialogue cards sparked more engagement than we anticipated, leading to longer conversations each turn and not being able to do more rounds before the allocated session time finished.

In the final session with the family, we tested a new idea that was developed during the session with Matilde. In this version, the healthy ageing cards acted as "lucky cards," with one card drawn each round regardless of whether the answer from the dialogue card was guessed correctly by other players. However, we observed that once players understood the cards provided extra points or spaces up the board, their focus shifted solely to that, rather than fully reading the descriptions of each initiative and discussing them.

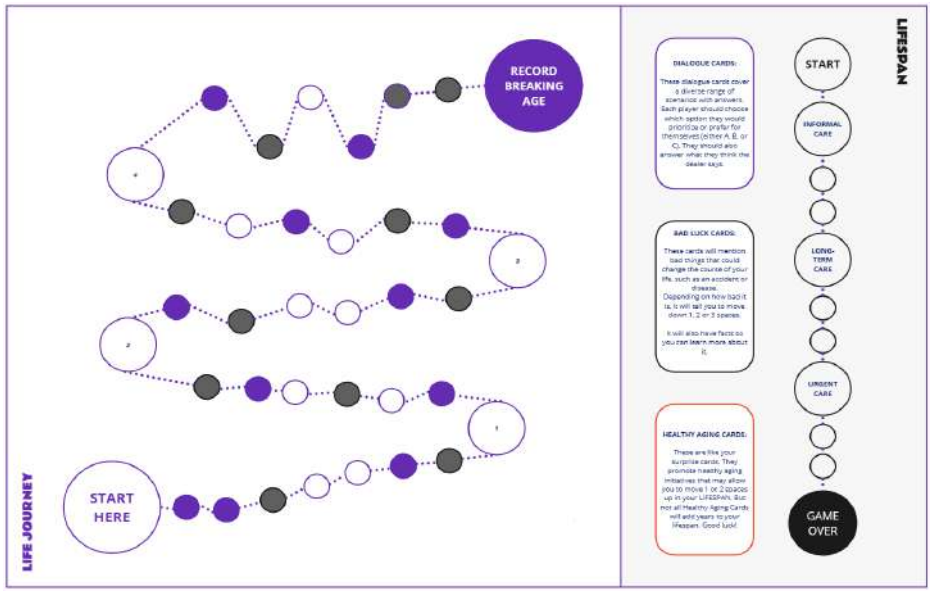

Figure 12: Prototype design of the game board

Once each player had their turn at least twice, we introduced the game variation that included the board, where players move up spaces instead of earning points (Figure 12). We did not observe drastic changes in how they engaged with the board, and we observed a mix of opinions about whether it was better to simply note down points or have a physical board where the journey of winning is more visualized.

The Process of Gathering Feedback

Throughout the game we wrote down our observations on note pads and remind co-designers to do the same. For instance, we noticed in both sessions with family members that they would make a comment about the game, but forget to write it down, even though post-its, pens and paper were distributed and people were encouraged to sketch and write down ideas since the beginning. Once we reminded them of their roles and re-enforced the idea that their thoughts and opinions are valuable, they started to become more vocal and taking notes. At the end, we shared our thoughts and brainstormed new possibilities by circulating the feedback sheet, pasting post-its and sketching over our prototype.

We also asked them to write down on blank cards other questions that they wished were on dialogue cards. While co-designers struggled to come up with ideas on their own for improving the game, their feedback was instrumental for us to move back to the backstage and refine the prototype.

Feedback from participants (co-designers)

Positive takeaways from their feedback.

Deep reflections and curiosity are awakened

Every participant enjoyed how subtly the game encouraged crucial family conversations, leading to important thoughts and life considerations. “The game made me reflect and want to go deeper into the different

perspectives". They all showed interest in what others answered and this was also reflected in their written feedback, with Mario stating that he was "interested to see how the others react to this matter" and António writing that he was "curious to know everyone else's answers". Participants were generally impressed with the game, and often said that it would be valuable for other family members and friends. The couple in the first session expressed surprise at the game's focus on ageing and said they would like to play it with their children. Finally, everyone supported the idea of allowing multiple answers for the dialogue cards, as thinking of an answer on the spot can be challenging and lead to weaker responses instead of deep reflections and discussions.

Game as an educational and informative tool

Mario described the game as a "lesson" while other participants called it "informative" and "educative". They appreciated the game's ability to share existing initiatives and remind people of different life scenarios that are important as older adults. Some also mentioned that it encourages people to start planning and that having an online platform with guides and resources would be useful.

Game objectives were understood

In the last session, we adopted a different approach compared to previous sessions, where we withheld from explaining the game's objectives to see whether participants could identify these elements on their own. While this initially led to some confusion regarding whether it was a game for pure enjoyment versus a dialogue and educational tool, this allowed us to assess if their understanding of the game aligned with our intended purpose. Their answers demonstrated that they were aligned with us. The daughter remarked, "It is about learning about yourself and others," and noted that the game encourages people "to start preparing for old age." The mother emphasized that it makes people "think more about the reality of ageing, and communicating with people around you about your plans and goals.". The father recognized the game's dual role as a dialogue tool and a research intermediary device, stating, "I think the objective of the game is to delve deeper into what they are researching, and to identify which areas should be pursued to improve old age."

Commercial value

Mario and Susana were eager to share this game with their friends and family, asking us to finalize the prototype and suggesting that we contact different companies and organizations (banks, municipalities, gyms, etc.) as they saw the potential for promoting it to the masses in collaboration with them. Matilde shared a similar view, suggesting that the game could evolve into a start-up.

Areas for improvement

Simplification of Rules and Winning Strategies

Players highlighted the need for clearer rules and simplification of the game, specifically clarifying how the game is won and the purpose of the board. Tiffany specifically mentioned the need for "a better understanding of how the game ends".

Each co-designer reflected on how the game should be played, with Mario suggesting that "maybe the points should be given and taken at the will of the person asking the questions" and Matilde saying that the game could benefit with less game elements and rules, even with the elimination of the Healthy Ageing cards to solely focus on the dialogue cards. Together, we also co-designed a different game version, changing

it to a collaborative format where one pawn on the board represents the entire family. This format could enhance the family-friendly nature of the game and encourage collective decision-making.

Players often forgot that the game was about choosing the preferable option and sometimes wanted to choose more than one option or none, indicating a need for clearer instructions.

Regarding the healthy ageing cards, there was confusion across all sessions about their purpose, when to use them, and why. Although Matilde made a good suggestion, the idea failed in the following session as we mentioned in the Session Observations section. Tiffany suggested including actionable tips on how to start initiatives, such as those related to financial planning, to make these cards more valuable and engaging.

Make it More Fun

Balancing the serious nature of the game's topic with an element of fun was a common concern among participants. Their feedback indicated that the heavy nature of the discussions sometimes made players feel sad or depressed, as Tiffany wrote "it made me most participants suggested removing the "bad luck" cards. However, several discussions think, but also sad because I am faced with the reality of what old age is". For this reason, arose around the possibility of creating different versions of the game to accommodate various family dynamics and humour preferences, such as for those families who may appreciate dark humour. Overall, they all agreed that "games should be fun", and that this could be done by changing the tone of the copy-writing.

Revisiting the game

The importance of revisiting the game regularly, especially after significant life events, was highlighted, specifically by the family of four. They shared that when they were diagnosed with cancer, their goals and thoughts about life drastically changes, underscoring the need for the game to adapt and for the online platform to allow users to keep updating their preferences and goals.

5.3. Re(framing)

Here is where we moved back to the backstage and organized all feedback and thoughts, then analysed, re-framed concerns, and iterated the prototype. Overall, the feedback from all participants highlighted the game's effectiveness in fostering communication about ageing, however, there was room for many improvements as per their suggestions, such as visual enhancements, simplification, and additional flexibility. Below is a brief explanation of the changes we made.

Clearer Objectives and Cooperative Play

We rewrote the rules to ensure the objectives of the game are clearer. The game was transformed into a cooperative experience to encourage team play and togetherness, with the board representing the family's journey. We emphasized the rules concerning the dialogue cards, ensuring players understand that the game is about choosing preferred options. All statements now end with either "I prefer..." or "I prioritize...". Additionally, we clarified that there are no right or wrong answers and that each person is entitled to their own opinions, which helps avoid unnecessary conflicts.

Enhanced Fun and Engagement

To make the game more fun and engaging, we changed the tone of the rules to be more casual and include hints of humour. For example, we might say, “Think of it like a family road trip: there are many routes, but the goal is to enjoy the journey together.”

We also introduced a new game element to the Healthy Ageing cards to increase engagement. Players now pick these cards, read them out loud, and vote on who they think is most likely to take that initiative. This encourages players to read the initiatives and reflect on them. In the case of a tie, players will resolve it with a classic round of “Rock, Paper, Scissors” to keep the game light-hearted and fun.

A solution for revisiting the game

We added a new rule where the player with the most Healthy Ageing cards at the end of the game wins a Mission Card. The Mission Card is only read at the end, creating suspense and curiosity. It states that this person is the best example for the family as they are more likely to adopt healthy habits. They are now responsible for motivating everyone to follow their example and are encouraged to sign up on the website, schedule, and organize the next game session to see how preferences change over time.

Time Management

Finally, we added to the rules a suggested time limit for each round to ensure that everyone has a chance to talk and to prevent the game from becoming too long and tedious. This ensures a balanced and enjoyable experience for all participants.

5.4. Solution Validation with Potential Collaborators

We interviewed Sara, the director of a care home to validate our concept.

Using Miro, we presented the very first draft of our prototype, and briefly explained the rules and objectives. “This could be interesting to develop with our Social Center users... These individuals are still relatively autonomous and manage their own lives. I think it would be important to engage them in this project”

She added that this solution has benefits for caregivers as well: I think that the fact that we have users who are already minimally prepared, or who at least come of their own free will, makes our work much easier” (P16)

Unfortunately, due to the care home currently being under renovation, the Social Center users do not go to the care home until July, when the renovations are predicted to finish, so this was not possible to perform before the delivery of this report.

We also had a short interview with Dr. Leonor to share our initial game ideas and see if we could interest her in further co-design sessions. She provided valuable feedback on the game’s concept, noting that “the game is very interesting” and identifying that the primary challenge is reaching families. She suggested that it might be easier to engage those nearing retirement but acknowledged that involving families with older members could be more challenging. Some families might avoid responsibility, preferring to rely on personal assistants instead of engag-

ing with the game. However, she emphasized that this should not be a deterrent. Dr. Leonor encouraged us to move forward with the initiative, advocating for the need to de-construct these avoidance behaviours rather than accommodating them. She argued that resistance from families should not lead to excluding them from the process.

Finally, Dr. Leonor accepted the challenge of co-designing the game but at a later stage, and more importantly to review the statements on the cards to evaluate their relevance towards healthy ageing based on her experience and knowledge. She also offered to test the game with her patients. Unfortunately, due to her busy schedule, this also did not happen during the time of this report.

5.5. Blind Playtest: Frontstage with a Different Strategy

The final round of testing, known as blind playtesting, involves distributing the game to players, including rules and materials, without providing them with further guidance or explanations. The designers' role is limited to that of an observer, and they should refrain from helping the players or responding to their inquiries. Blind playtests are useful usability evaluations to understand the viability of game dynamics and rules (Humphrey, 2021). We chose this way of testing to see if the game had the potential to be used on its own without our intervention, and if it met the objectives.

Name	Parental Relationship	Age
Pedro	Father	53 years old
Clara	Mother	49 years old
Carolina	Daughter	23 years old

Figure 13: Name and age of participants of the blind test session

This session was conducted with a Portuguese family of 3 (Figure 13) who printed and cut the game at home, read the rules, and played independently while we observed thought teams.

As the family began to read the instructions, they seemed to enjoy the fact that we made them a little funny (See appendix). Overall they seemed to understand the instructions with minor confusion: "Can we vote for ourselves in the healthy ageing cards?" Carolina asked. And since that was missing in the instructions, that was the only exception where we intervened in the blind test to clarify since we missed it in the rules, therefore, we said: "no, otherwise the player might want to vote for themselves to get more points" . There was also confusion about whether "Player A" was a rotating role or fixed, indicating a need for clearer instructions. This time, we let the family figure it out, which they did after a second review of the rules, however, we took notes to make the instructions more clear.

Despite the initial confusion, they were able to finally start the game. They became so engrossed in the conversations right on the first drawn dialogue card that they forgot to draw a healthy ageing card at the end of the first round, which they soon realized, and in the second

round, they took two healthy ageing cards instead of one to compensate for the first round.

In all the dialogue cards the players felt the need to explain and discuss the options. For example, Pedro commented on the multiple-choice answers: “It’s very subjective since it depends on the phase of our lives” adding that they do not know a lot of alternative options other than a care home. This comment initiated a discussion on living arrangements and how these might change over time. Later, in a different card, Clara explained her choice when everyone got it wrong: “I prefer to enjoy life now. The retirement money will be enough for a nursing home if I need it.” The game then guided players to discuss their medical care preferences, which raised divergent opinions. The same happened with the cards about their funeral arrangements and with their preferred activities after retirement to maintain their social and physical activities. Each family member passionately defended their perspective, illustrating the diverse points of view within a single household. This demonstrates that when people do not talk about these topics and one person makes decision on behalf of another person, it might not be the other person’s preference.

We noticed that at first, Pedro was very sceptical about the healthy ageing cards, designed to inform one of the healthy ageing initiatives that one could adopt. When he read the first card he said: “I don’t imagine myself doing this and I don’t know if anyone will do it” to which Caroline replied, “Why not, I imagine myself doing it. Maybe you should rethink that if you want to age healthy”. She then adds “ I believe the purpose of these cards is to show what you should do to age well and in good health.”. We were relieved that Caroline understood the ‘hidden purpose’ of these cards and was able to ‘explain’ it.

As previously mentioned, we introduced an element of fun by suggesting a round of “rock, paper, scissors” in case of a tie when voting for the most likely person to engage in the healthy ageing activity described on the card. This exceeded our expectations. When they eventually tied, they began playing this game, and it was amusing to see them continuously tie, which made them laugh even more. However, we realize that the reason for them to laugh so much might be because they kept tying, which might not happen with other families. We felt that this little moment of humour lightened the atmosphere and helped the conversation flow more easily.

After the game, there were just a few minutes left when they shared their feedback aloud. Clara initiated the discussion: “It is interesting for people to talk about some topics. It is also important to revisit this game some years later because there are some questions that we cannot answer because we haven’t debated/talked about it yet.” Pedro adds: “and we will keep changing our ideas and perspectives” to which Carolina comments, “that’s why they recommend it on the last cards” (Game Over Card).

Clara continues: “Promoting the game among older individuals is important, but it’s also valuable for people in our age and with families as we did, as it helps to gain different perspectives and listen to each other’s opinions without criticism, fostering understanding. Hearing arguments from all sides enriches our own opinions and often leads to change them.” However, she reflected that the game may not be suitable for individuals facing delicate health situations, such as Pedro’s mother, suggesting, “It wouldn’t be appropriate to play with your mother because of her complicated situation. It would be awkward to discuss it now, but it should have been addressed earlier.” Pedro concurred, suggesting it

would be more suitable to play the game with Clara's mother, as she is still very autonomous, along with her siblings.

Then we asked their opinion on the objective of the ageing cards, as we noticed some initial doubts. Carolina responded, "I believe it's about generating ideas for living a healthier, longer, and higher-quality life in society. These cards provide us with ideas for activities we can engage in." Clara added, "I perceive them as a very positive aspect," mentioning, "I now plan to explore healthy initiatives."

Regarding the rules, they found them clear and objective but preferred if they were explained with images or a tutorial video, although they acknowledged the importance of having printed instructions.

Just before we finished this session with this family, we asked what they would do after playing this game. They thought for a moment and Pedro said: "I will go for dinner.". We then showed a checklist of what they could do to maintain a healthy life while ageing and mentioned a web platform with resources for them to plan for healthy ageing to which they thought would be very useful. They said they would like to have that option even if they might not go there right after because they felt they were still far from the older age where they needed to start planning, but they think it would be very useful to have that option. We asked if they would like a follow-up/ reminder, and they said yes. Then we asked what they thought of a "letter to my future self" option, and Clara said that she had thought of that so many times but never got the incentive to start it, perhaps this helped, and she will do it now as she said. Overall, they struggled to come up with ideas of their own but were useful in providing feedback for our ideas, which allowed for a collaborative brainstorming session with each different user.

Due to the limited time available for brainstorming, we requested that they provide feedback on a Miro feedback page at a later time, which they did. Their written feedback was thoughtful and constructive, highlighting positive aspects of the game and offering important suggestions for improvement, which we were unable to implement due to time constraints in writing the report (see appendix X- full written feedback).

This blind test session served to understand how a family would react to such a game, without any explanation from us. The conclusion we reached is that although it was printed at home and had little aesthetic appeal, the underlying purpose of the game was captured. The game sparked inspiring and meaningful conversations that they themselves said they had never had before, and they were surprised by each other's responses, despite initial confusion and scepticism about certain elements. This test revealed strengths and areas for improvement in the game itself.

5.6. Reflections and Future Considerations About the Solution

While it is uncertain that this game will prompt people to make concrete plans for their later years, we believe that initiating these conversations is a crucial first step. Each player has the opportunity to articulate their aspirations and preferences concerning the activities they envision undertaking as they grow older, as well as their desired lifestyle choices. The intention is for this game to break the stigma associated with discussing old age and to sensitize people to look at ageing differently,

highlighting the importance of staying mentally and physically active for maintaining health and well-being as one grows older.

Game Versions and Frequency of Play

Based on the co-design experiences we have been considering creating two versions: one for board game enthusiasts which would include more complex game mechanics, and another as a simplified dialogue card game that can be used by professionals. The game's potential to initiate meaningful conversations suggests benefits in both formats. Participants agreed that currently the game is not suited for frequent play, suggesting once a year or every two years as appropriate intervals. With a more complex board game, including more rules and winning strategies, there is a chance that we could target younger audiences and encourage them to play more frequently, with the hopes that more regular playing will unconsciously keep players reminded of the importance of discussing and planning for healthy ageing more often. The simplified single use game version could be used by caregivers and psychologists to engage with their patients and their patient's relatives if rules are simpler and more understandable, making the game more accessible.

Recognizing Topic Sensitivity and Outcome Limitations

Another issue to consider is the sensitive nature of the topics addressed by the game. While our game aims to make these conversations easier, it might still be too uncomfortable for some participants. This raises the question of whether the game might be too controversial for some users and if a different type of solution should have been developed for those. There are also limitations in the game's ability to guarantee specific outcomes, such as users adopting healthier habits and initiating estate and care planning upon playing the game. While the game effectively initiates discussions and encourages reflection, currently, it cannot ensure that users will take concrete actions based on these conversations. While the main goal is to open up dialogue and create awareness, rather than to mandate specific decisions or behaviour, we believe more motivational strategies may be beneficial to incite users in taking action towards healthier ageing.

Post-Game Actions

Participants initially struggled to suggest post-game actions. Introducing an online guide with steps for healthy ageing received mixed reactions. While some found it unnecessary, others recognized its potential value, particularly for those less inclined to plan proactively on their own. While the last version of the game includes a card that recommends players to join the website and a mission card to make someone responsible in encouraging everyone to actually make healthy changes in their life, we recognize the need for further testing and validation of this idea.

Balancing our Creativity vs Co-Designer's Input

While it is important to take into account co-designer's feedback, it is also important to value our own knowledge and creativity. For example, some of the initial co-designers did not find the healthy cards that relevant, however, that could have been due to us not being very clear

about the objectives, or the playing mode of using those cards was simply not fun enough. If we had disregarded them right away due to their feedback, we would have lost the important aspect of promoting healthy ageing initiatives. Instead, we added a new game element to the cards, and during the blind playtest, this was well received.

Another instance of this was with the collaborative versus individual game playing. When talking about board games, people who are less familiar with board games, and even less of the existence of cooperative games such as Forbidden Island or Pandemic, may initially think that the objective of the game presented to them is to win as an individual, which is what we noticed during our co-design session. Regardless of the initial confusion about the collaborative playing mode felt by some players, we did not prematurely scrap that idea. Our belief is that this game should represent unity and togetherness, because family involvement is crucial to decision-making and therefore it should not be putting players against one another, as would occur in a competitive game. More tests are required to confirm this idea but the Blind Playtest showed potential.

6

DISCUSSION

6. DISCUSSION

In addressing our research question, we followed the principles of Participatory Design and employed the comprehensive design process under the guidance of SNS which played a crucial role. This approach involved iterative co-design sessions with diverse participants to test and refine our prototype. Our research aimed not only to create a functional tool but also to understand its potential impact on users' willingness to engage in the sensitive topic of aging. We were able to navigate strategic concerns and reconcile diverse perspectives. This approach ensured that our final prototype was well-aligned with users' needs and concerns.

Our objective was to determine if we could effectively open up discussions about aging through an engaging game and move them closer to making informed decisions about healthy aging. According to the feedback we received from our co-design sessions, the game effectively initiates these reflections and conversations about their own and their loved ones' preferences, highlighting viewpoints they had not previously thought of. Moreover, the game's subtle approach to prompting discussions and promoting healthy aging was well-received.

6.1. Limitations of our Project

Despite the strengths of our project, several challenges and potential controversies emerged.

We based a large portion of our concept on the findings from our ethnographic research, however, these may have been different if the research was performed at other places, taking the project on a completely different course.

Besides the benefits of focusing our case study in Portugal, we recognized that it may have also brought certain limitations, since we were only locally present in March and had to perform the remaining interactions online or with Portuguese actors that were living or visiting Denmark. If we were locally present during the entirety of the project in Portugal, perhaps we would have been able to visit and collaborate with more care homes, families and organizations to increase the viability of the solution.

Conducting co-design sessions online offer benefits, such as being able to broaden the study and discover differences between other communities and cultures. However, there are notable barriers, especially technological challenges faced by older generations who are less familiar with computers and online platforms. We noticed this during our online co-design session in a few instances, such as struggling to open the meeting link, getting the camera on and sound adjusted, or difficulties in visualizing the game materials on the screen. These challenges unexpectedly delayed our sessions and should therefore be reconsidered in future online sessions.

Although participants were asked to add new questions at the end of the co-design sessions, we recognize that a dedicated workshop focused solely on gathering relevant questions and initiatives could have been beneficial. This approach could have enhanced the central part of the game. Now that we understand the game's potential, refining its content is essential.

Co-design sessions are time-consuming and require extensive planning. Finding participants available for long or multiple short sessions within a short time-frame is challenging. This constraint, along with the limited time to deliver our thesis, led us to concentrate more on the first phase of our solution. This limited our ability to design the entire concept, including the game and platform. Consequently, we were unable to fully test the idea of combining an online platform to create profiles and start personalized planning guides. Even though there was a limited interest from participants when we shared examples and discussed the concept, we are unsure if it is due to insufficient visual explanations or a misalignment with our target audience.

Adapting the process continuously is crucial, as things may not always go as planned. Despite our aim to engage many actors, we often faced unresponsiveness or scheduling conflicts. For instance, a care home we collaborated with was undergoing renovations, delaying our workshop plans with their daily center residents beyond our project's delivery date. Many more actors, including organizations and municipalities such as CUF, Porto4Ageing, RSCN, Junta de Freguesia de Fátima, and Ældre Sagen (see appendix...), could have been relevant to this project. Although we reached out to a few during the discovery and development phases, responses were often not obtained. We plan to reach out to some of them again with a more detailed version of our objectives, hoping to enrol them in the delivery phases.

Addressing a complex topic such as ageing makes it challenging to narrow down and focus on specific aspects within the project's time-frame. Despite our accomplishments, there remains much more we aspire to achieve. While we focused on the social aspect of sustainability, a more comprehensive project would also assess the game's impact on the environment and economy, aligning with the three pillars of sustainability. We believe that this project is a good starting point, as it has the potential to change behaviours, however, extending the overview of sustainability challenges should be considered in the future.

6.2. Contributions to the Field of SDE

With this project, we applied several competencies acquired through our master's degree in Sustainable Design Engineering (SDE) and contributed to the field with new knowledge.

We did this by addressing social sustainability concerns within the context of aging, and emphasizing social equity, inclusion, and the benefits of discussing and planning to achieve quality of life as we age.

A crucial aspect of the SDE field is the ability to collaborate effectively with various actors, including individuals, families, organizations, and various fields, such as healthcare, gerontology, sustainability and game design. This collaborative and interdisciplinary approach allows us, sustainable design engineers, to identify different needs and concerns, align all stakeholders with the sustainable agenda and project goals, and produce holistic solutions, whether they are products, services, systems, or strategies. Achieving successful collaboration requires a set of creative, practical, and interactive methods and tools that we learned through our program. These skills were specifically important for planning, facilitating and describing our co-design process.

We also hope to show with this project that healthy aging is an important topic that should be addressed in the field of sustainability, expanding

itself from more common topics, such as climate change or agriculture, and re-enforcing the need to address social aspects as well.

The development of a game-based tool through co-design processes provides a practical platform for knowledge transfer and capacity building in the field of healthy aging and social sustainability. By empowering individuals to co-create and explore aging-related topics, the project enhances awareness and understanding of healthy aging practices that have the potential to drive positive change. The user-friendly nature of the tool, achieved through collaborative design, increases its likelihood of adoption and long-term impact.

By sharing an example of how sustainable solutions can be designed through collaborative and interdisciplinary approaches to address complex sustainability challenges related to aging, fellow designers and researchers are now able to follow our process, learn from it, and build upon it, or be inspired to produce similar projects.

6.3. Future Research and Next Steps

While a large portion of this project was dedicated to a literature review and ethnographic research, it would benefit from further research and development. As presented earlier in the literature research chapter, the Decade of Healthy Aging presents four areas of action, however, and while we tried to present different scenarios and initiatives related to these topics with the game, we believe they can be improved and integrate more aspects. Furthermore, we only unlocked the first phase of our four phase concept (the game) and therefore more research and development are required to see the potential of the game and platform, from initiating good conversations within families, to leading them to planning later stages of their lives.

The project would also benefit from more co-design sessions and testing, leading to new ideas and insights to improve the final solution. Upon each participation, a follow up is also crucial to assess if any impact was made through the game and later through the platform. It would also be important to see how well our solution would function if introduced by different actors. For example, a psychologist and caregiver have shown interest in testing the game with their patients, which may lead to interesting results and truly understand the impact it may have on society.

Finding additional partners for the promotion of our solution is essential to extending the reach of our solution, beyond local settings. This is where local municipalities, organizations, companies, and news and media outlets can have a major impact. It is also important to discover ways to measure the impact of our solution. Our vision is that the game can be easily accessed by anyone, and then having a fully funded online platform where families have easy access to resources and guides, and insert their details and preferences. We can then share this valuable data with municipalities, if security and confidentiality aspects are assured. By providing local authorities with insights into the needs and preferences of their residents, we can collectively work towards creating more responsive and inclusive community resources and support systems.

Moving forward, further research and implementation of such participatory approaches are essential to address the evolving needs of an aging population and promote a society that values and prioritizes the well-being of all its members. By teaching through showing, we hope that fellow research designers can learn and build upon this project.

7

CONCLUSION

7. Conclusion

This report contributes to new knowledge in the field of Sustainable Design Engineering, particularly in the context of promoting healthy ageing through innovative co-design approaches.

We started by presenting the various challenges associated with an aging population and the existing collaborative efforts to promote healthy aging. Followed by an ethnographic research, we delved into the lived experiences and perspectives of older adults, caregivers, and experts in the field. Through a combination of desk research, observations, and interviews, we gained a nuanced understanding of the complexities surrounding aging. This initial research also brought to light the stigma associated with the topic of aging. The idea that everyone is ageing as soon as they are born is often not thought of, as many individuals continue to view aging as a disease and avoid discussing and preparing for the later stages of life, hindering, in this way, the opportunity to age gracefully.

Drawing upon the knowledge gathered in this phase of the project and through co-design engagement with diverse actors, such as family members of different ages, we co-created a dialogue game that serves as an “ice breaker” to facilitate conversations regarding ageing while also fostering a deeper understanding of the importance of healthy aging practices. The co-design approach, along with the comprehensive framework of staging negotiation spaces, were instrumental in guiding us throughout the project, from framing the problem, to producing objects, planning and facilitating negotiations between different opinions and concerns among participants, and finally refining and validating our solution. This iterative co-creation process ensured that the solution resonated with the needs and aspirations of the target audience.

The solution aligns with several Sustainable Development Goals (SDGs). For example, by encouraging financial planning and raising awareness about social security and care services, we support SDG 1 (End poverty in all its forms everywhere). The game also emphasizes the importance of preventive care and staying active, aligning with SDG 3 (Ensuring healthy lives and promoting well-being for all ages). Finally, by empowering decision-making through proactive planning, we contribute to SDG 10 (reduce inequality). While our project draws consideration from all action areas of the UN Decade of Healthy Ageing, it fits best within Combating Ageism. Ageism, the idea that our thoughts, feelings, and behaviours toward ourselves and others influence how we age, is directly addressed by our dialogue game, which acts as a bridge to alter perspectives on aging.

Overall, this project has demonstrated that through co-design, powerful tools can be developed to solve sustainable complex challenges, such as unlocking conversations and promoting healthy aging practices, in our case. This paper contributes valuable insights to the field of sustainable design engineering by demonstrating the entire process, from discovery to delivery.

8

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