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Be.side: Maintaining Continuing Bonds in
Bereavement through the Multi-Modal Design

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Graduate School of Media Design

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A Doctoral Dissertation
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Abstract of Doctoral Dissertation of Academic Year 2024

Be.side: Maintaining Continuing Bonds in Bereavement through the Multi-Modal Design

Category: Design

Summary

Bereavement is a universal experience, yet each person will undergo it differently depending on their individual characteristics and social environment (Rosenblatt 2008). According to the literature from psychology and psychiatry, continuing bonds, defined as *"ongoing inner-relationships"* between the bereaved and the deceased (Stroebe and Schut 2005), are a natural instinct and phenomenon that can be leveraged by the bereaved to help them move forward from their loss and bereavement (Field et al. 2003, Klass et al. 2014).

To seek to maintain continuing bonds, the bereaved need something to evoke the deceased. Therefore, the initial concept saw the creation of a "channel" to evoke the deceased that could in indirect ways evoke memories of the deceased and maintain continuing bonds. These would support the bereaved to recreate their new relationship with the deceased. Ultimately, this direction led to the creation of an artefact that could interact between the deceased and the bereaved through memory recall. It could also act as a personal memorialisation and personal communication tool through continuing bonds. This artefact is called *Be.side*, a fully bespoke multi-modal artefact that includes scent, sound and heartbeat stimulation with translucent lighting, which together form the channel between the deceased and the bereaved. This artefact is a catalyst to remembrance, maintaining continuing bonds.

In order to research the area, a long-term study was carried out with three bereaved participants understand how they maintain continuing bonds with the deceased through *Be.side*. A participatory design approach was taken because it allowed the participants' own experience and personal memory to be included

in the research. Moreover, "Iterative" is one of characteristics of participatory design, participants were able to give continuous feedback that built up insight and could determine some of the direction of the study. The results indicated that the bespoke elements of *Be.side* helped the bereaved evoke the memories of their deceased loved ones. Participants created personalised rituals for maintaining continuing bonds. In addition, participants were able to maintain continuing bonds with the deceased not only through their engagement with the artefact but also as a result of engaging with the entire research process including rapport building, repeated interviews, collaboration as participatory design. In particular, iteration of development and adjustment of each element encouraged them to maintain continuing bonds and to made a completely personalised product that could evoke their deceased loved ones. In conclusion, I discussed how continuing bonds with the deceased can provide comfort to bereaved individuals alongside their sense of bittersweet.

Keywords:

continuing bonds; channel; memory; multi-modal; participatory design

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My doctoral journey, which commenced in September 2019, was a path of challenge, particularly due to the disruptions caused by the COVID-19 pandemic. However, with the help and support of many individuals, I was able to successfully complete it.

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their insights, experiences, and valuable results, which greatly contributed to the depth and quality of my research.

The passing of my father, which marked the beginning of my research journey from 2016 at the Royal College of Art, was a deeply personal and transformative experience. Through interviews with bereaved people and my personal experience, I discovered that even when loved ones have passed away, we continue to long for and maintain an internal connection with the deceased by cherishing their memory and engaging in conversations. I learned that this phenomenon is termed as a "continuing bond" in psychological terms. Also, I found that as time progresses, individuals gradually forgot the departed and focused on their own lives, yet they experienced feelings of guilt for forgetting the deceased, and sometimes evoked the deceased and missed them.

I wanted to help to these complicated emotions through my design something affirmative way, thus I proposed Be.side. I observed how continuing bonds can be maintained through Be.side, and how continuing bonds can be affected the bereaved people's lives affirmatively, and serving as a channel between the deceased and the bereaved for future exploration. I found satisfaction in providing a platform for individuals to build a continuing bonds with the deceased over time and adopt a positive attitude toward this challenging topic through my design.

During my doctoral studies, I also faced the loss of my beloved dog and grandmother. These losses brought not only sorrow but also a profound understanding and reflection on my research topic. Throughout my research, I had the privilege of meeting many individuals who had experienced various forms of loss. Engaging in conversations with them and exploring my research further, I could also maintain continuing bonds with my father, my grandmother and my dog, and I found a sense of healing within myself as well. As we look ahead to the inevitable part of life that is marked by many more farewells, I hope that my research can be of assistance to many people.

Chapter 1

Introduction

1.1. Calling to Me

I could say that my life took a significant turn in 2015, the year my father passed away. In 2014, he was diagnosed with lung cancer, and after a prolonged six-month battle, he passed away in 2015. During his illness, the cancer spread from his lungs to his brain, and he became unable to move and speak. Caring for him and dealing with his eventual passing was a complex and emotionally painful experience for my family and myself. While grief was a natural part of the process, we also had to grapple with the practicalities of dying. My late father was a meticulous and organised person. In anticipation of his declining health, he had diligently recorded all his information while he was still lucid; passwords for email, suitcases, and bank accounts. The records proved immensely helpful for my family as we sorted out his affairs after his passing. Experiencing this situation led me to choose "preparing for death" as my Master's research topic. Moreover, as life expectancy widens, the topic of preparing for death becomes increasingly significant for everyone. Therefore, the Master's project, *My Legacy*(Figure 1.1) emerged from a combination of my personal experience and social interests. This project has also had an influence on my PhD research. *My Legacy* offers an opportunity to remember the deceased loved ones through a 'scent' after they pass away, as many bereaved interviewees had expressed a longing for the scent of their deceased loved ones. The design of *My Legacy* is a portable toolkit that allows people to instantly capture meaningful scents from anywhere and transform them into fragrances. Our sense of smell is intricately connected to our memories, with specific scents having the power to evoke particular memories. The captured odor molecules are replicated as scents using 'Gas Chromatography (GC)'(Bartle and Myers 2002) technology to analyse the data.

Figure 1.1 My Legacy: preserve your memories as a scent

In addition, the increase of the public's interest in using technology to relieve longing of the deceased challenged me to investigate this subject further. The South Korean documentary called "Meeting You (2020)"[1] showed a mother meeting her late daughter's avatar through a VR environment. My first impression was that discussing the subject of death in South Korea has evolved significantly, breaking cultural taboos and superstitions that once deterred such conversations (Campbell et al. 2018). The fact that TV broadcasts on this topic have garnered high ratings is indicative of shifting perceptions and attitudes toward death in South Korea. However, my second thought revolved around the role of technology in helping the bereaved individuals in coping with their grief and longing. I asked myself, "Does meeting a deceased avatar in virtual reality (VR) help to relieve their longing?" In addition, the reactions of audience to the documentary were divided, with some acknowledging the potential of technology to evoke human emotions, while others viewed it as overly artificial, unnatural, and tear-jerking.

Furthermore, many medical professionals were concerned that an intense experience of grief in virtual reality (VR) may lead to potentially detrimental psychological effects on the bereaved. These effects could include the blurring of lines between reality and the virtual environment or the development of an addiction to seeking emotional relief from interacting with the avatar. Support for this viewpoint comes from another South Korean documentary called "The Age of Immortality: Mechanical Man–Cyborg and Digital Twin(2021)"[2]. It showed a man who had lost his wife a year ago and wanted to create a wife's avatar for his two daughters. However, when he first met the wife's avatar, he felt uncomfortable and couldn't fully accept it as his wife. During an interview, he expressed

difficulties as painful memories resurfaced while gathering data for creating the avatar.

This result shows that while perceptions and attitudes toward death are evolving, we still face challenges in dealing with grief, mourning the deceased and establishing new relationships with the deceased (Shear et al. 2007, Stroebe and Stroebe 1991). In this regard, a wide range of studies in fields such as psychology, psychiatry, and sociology have articulated bereavement theories, focusing on how to cope with grief and move forward. In contemporary bereavement theories, one approach to resolving the feeling of loss is to create *"continuing bonds"* (Klass 2006).

Given this social context in relation to my personal experiences and previous research, I considered the significance of incorporating continuing bonds into my design. This can be meaningful in terms of contributing the bereaved's grief, longing and reconstructing our personal relationship with the deceased loved ones. It's worth noting that in addition to commercial documentaries like the one mentioned earlier, researchers and designers in the fields of Human-Computer Interaction (HCI) and design have started exploring topics relating to mortality. This includes the design of digital memorials (Häkkilä et al. 2019, Gach and Brubaker 2021, Maciel et al. 2015, Moncur et al. 2012), the creation of new forms of legacy for the deceased (Uriu and Odom 2016, Jørgensen and Jenkins 2023) and so on. However, it is important to highlight that very few studies have delved into the value and application of continuing bonds within this context (Wallace et al. 2020). Moreover, using technology as a means to address grief raises ethical considerations, particularly due to the absence of clinical data in grief (Pizzoli et al. 2021).

Therefore, this PhD research has explored the potential of continuing bonds from a context of design, and how my design can contribute to maintaining continuing bonds for coping with those feeling of loss and grief and therefore offering positive ways forwards.

1.2. Continuing Bonds with Memories

Continuing bonds is defined as *"an ongoing inner-relationship"* between the deceased and the bereaved (Stroebe and Schut 2005, Field et al. 2003). The idea

of maintaining a connection with a loved one who has passed away is a natural instinct and phenomenon for most people who experience bereavement at any stage of their lives (Klass 2006). Continuing bonds may be a comparatively normal component of bereavement (Root and Exline 2014, Klass et al. 2014, Klass et al. 2014).

We continue our bonds with the deceased in diverse ways. For example, creating and wearing jewellery containing the hair of a deceased person (Holm 2004), remembering the anniversary of one's death, praying or one-sided conversations with the deceased assuming that they may somehow hear us (Lamia 2022, Field et al. 2003) can all be described as different forms of continuing bonds. In particular, thinking of memories of the deceased is the most natural, common and representative way of maintaining continuing bonds, and memories can be triggered by human senses (Lamia 2022). In terms of memory evocation through human senses, it is well-known that the famous Proust phenomenon notes that smells can be leveraged to spontaneously evoke highly vivid autobiographical memories(Chu and Downes 2000). Similarly, music associated with autobiographical memories of an event can serve as a powerful trigger for nostalgia (Juslin 2013). The feeling of loss and longing to preserve memories of the deceased loved ones are familiar to anyone who has experienced bereavement.

However, the bereaved may also intentionally avoid thinking of the deceased since they are uncertain about how to cope with their grief (Shear et al. 2007, Stroebe and Stroebe 1991). In this regard, to support the process of continuing bonds and help the bereaved individuals cultivate memories as a way to manage grief after bereavement, this research introduces a multi-modal artefact, *"Be.side"*. *Be.side* is designed to facilitate continuing bonds between the bereaved and the deceased through their memories of the deceased. It explores the process of how bereaved individuals create and maintain continuing bonds with their deceased loved ones through their memories, the impact of continuing bonds on their lives, and the effective integration of technology into the grief experience.

1.3. *Be.side* with Participatory Design

Be.side is a multi-modal artefact, designed to fit in the palm of your hand and featuring translucent lighting. It consists of three core elements: scent, sound and heartbeat simulation, each acting as a catalyst to help bereaved individuals evoke memories of their deceased loved ones. The naming of *"Be.side"* initially refers to the concept of being "next to someone or something". It also indicates the intention to contribute to the bereaved in helping them feel closer to the deceased loved ones. Additionally, *Be.side* includes an 'Instruction Manual' and a 'Question Book' as part of a comprehensive package that can guide conversations between the bereaved and the deceased (Figure 1.2).

Figure 1.2 Multi-modal Artefact, *Be.side*

The design process of development of *Be.side* was structured into two main stages, "Phase 1: Basic Framework Design", "Phase 2: Participatory Design". I designed the framework and components of *Be.side* myself in "Phase 1: Basic Framework Design". In "Phase 2: Participatory Design", I documented the needs

of three bereaved participants during the rapport building, and we worked collaboratively, and created three individuals' bespoke *Be.side* via participatory design approach.

After field research with seven participants, my initial concept was to propose a channel between the deceased and the bereaved. I then conducted several experiments with three out of the seven participants, to observe how human senses can evoke the memories of the deceased. I discovered that scent and sound should be intimately connected to the deceased individual. The role of the heartbeat simulation was to help participants feel calm and reflective, and to create an immersive atmosphere. As result, the combination of scent and sound based on the heartbeat stimuli triggered the recollection of their deceased loved ones among the bereaved participants, and provided them a sense of comfort (see Figure 1.3 on the next page).

Adapting a participatory design approach(Simonsen and Robertson 2012) to collaborate with another three new bereaved participants and one participant who was involved from Phase 1, I started to build a rapport with three participants, fostering intimacy, trust and listening to their requirement of their bespoke *Be.side*. The representative scent and sound of the deceased were recreated by each three bereaved participants and myself. In addition, we adjusted the speed of heartbeat simulation to create an immersive and comforting atmosphere. In terms of "iterative" being one of characteristics of participatory design, and considering the personal nature of the topic, I invited participants to make continuous feedback and request. Therefore, participants *Yui* requested to attach a photo of her late father in the *Be.side*, while participant *Min* requested another scent and sound. *Nara* didn't request, but she put herself her late father's letter into the *Be.side*. I learnt that participatory design approach gave participants a sense of ownership of the artefact, hence, they used *Be.side* to recall memories of the deceased, they cultivated strong bonding and gradually developed personalised rituals with the artefact. The research process, especially the weekly interviews, facilitated emotional expression, which helped them maintain continuing bonds. During the long-term study, the participants experienced both comfort and bittersweet emotions, yet they managed to maintain continuing bonds and gained a deeper understanding of their deceased. After the long-term study, participants

had the flexibility to continue using *Be.side* as a new channel for meeting the deceased loved one at their convenience to maintain continuing bonds with the deceased.

1.4. Objectives of Research

The objectives of the PhD research are to apply the concept of "continuing bonds" to a design context, to encourage the bereaved to relieve grief and to find meaning following the demise of the loved one one as well as to build a new relationship with the them. To do so, I created the fully bespoke, multi-modal artefact *Be.side*, to explore how the artefact can be allowed as a channel for maintaining continuing bonds. The research also sought to investigate how various sensory elements can impact the bereaved individuals' experience in supporting nostalgic memories, and how leveraging the artefact to engage in continuing bonds might affect the bereaved individuals' longing. To achieve this goal, a continuous participatory design approach(Simonsen and Robertson 2012) was required to ensure that actions and outcomes consistently aligned with the needs of participants (Hansen et al. 2020). Designed artefact *Be.side* in this manner will be culturally and contextually suitable for their personal bereavement experiences and their desire for continuing bonds (Jung et al. 2023).

In this dissertation, in addition to participatory design, I employ ethnographic qualitative research and Research through Design (RtD) to explore the personal, emotional memories and grieving experienced during field experiments with bereaved participants.

This research attempts to answer these three questions below:

[RQ1] What is the value of continuing bonds?

[RQ2] How can the multi-modal artefact help the bereaved in maintaining continuing bonds with the deceased?

[RQ3] If the bereaved proactively reflect on the deceased in their lives, how does it affect the bereaved?

Figure 1.3 Process of creating continuing bonds through *Be.side*

1.5. Academic Contribution

While most psychological studies have traditionally focused on encouraging the bereaved to detach from the deceased after bereavement, in contemporary bereavement theory, continuing bonds in bereavement are now recognised as valuable in addressing feelings of loss and grief. Furthermore, the majority of bereavement theories concentrate on Europe, leading to a lack of studies relating to Asia. In this regard, I tried to observe individual, social, and cultural perspectives in continuing bonds with the deceased by limiting the participants to South Koreans and Japanese during in-depth interviews, field research, and long term study.

Moreover, there is limited research conducted in the context of design concerning bereavement, especially lack of design study of continuing bonds. Therefore, designing an artefact related to continuing bonds in bereavement can be a valuable contribution. In particular, this research observes and analyses how continued engagement with *Be.side* can contribute to the process of maintain continuing bonds, and how the bereaved make the new relationship with the deceased through this such a new artefact. A deeper engagement of participants through their childhood memories and an analysis to explore how the bereaved find comfort, and how their lives change when they maintain continuing bonds with the deceased, can provide unique and valuable contributions in the fields of design, HCI, and continuing bonds studies.

Lastly, there are few case studies using technology on bereavement and continuing bonds, and there is no clinical data using technology on bereavement. The recent attempt to use Virtual Reality (VR) to replicate a digital avatar for alleviating the bereaved longing has raised concerns among medical professionals. They are considering the emotional states of the bereaved and the potential impact on their future emotions. Therefore, to verify the safety of *Be.side* and minimise the possibility of generating negative experiences, the final prototype was reviewed by three experts; two psychiatrists from South Korea and Japan, and a professor in a psychology department at Keio University, Japan. They confirmed that *Be.side* is an immersive artefact and is unlikely to evoke negative emotions, and it offers an abstract way to help bereaved participants recollect memories of the deceased, affirming its safety for long-term deployment. Therefore, this research can serve as a good case study of the use of technology and design for sensitive topics. To

sum up, this PhD research has the potential to deepen the understanding of the continuing bonds theory and contribute to the topic of death and bereavement using design and technology.

1.6. Structure of the Dissertation

This PhD dissertation consists of five chapters as follows.

This research began by articulating my personal experience as motivation, in order to share the foundation of this project's context. The dissertation will then present the most relevant literature and related works that underpin the topic of this project.

Chapter 1 introduced my personal experience of bereavement which is my core motivation for exploring this research; the purpose and key questions of this PhD research, and the overall structure. This chapter presented how I have developed my design through continuing bonds, and articulates the contribution of research to academic fields.

Chapter 2 provides the reader with the necessary background knowledge and context of this PhD research. It consists of three main sections. The first section reviews the current literature of bereavement, grief, mourning and continuing bonds in different academic cultural discourse, and related works within the realm of those fields. The second section reviews recent works which conducted within the field of technology in bereavement. The last section reviews the correlation of evoking memories through human senses. I finally summarise what I've learnt from these literature reviews and narrow down my research direction.

Chapter 3 illustrates the processes making up the design journey. This chapter describes the methodology; two phases of the design process, and the finalised prototype in the form of a research product *Be.side* for proof of concept.

Chapter 4 presents the process of the long-term study and validates my design concept. This chapter describes data collection and analyses it.

Chapter 5 discusses the findings from long-term study through the research questions and through insights gained from previous chapters.

Chapter 6 concludes my PhD research and describes its limitations; the original contribution to knowledge, and its potential impact. This chapter also proposes future studies.

Notes

1   "Meeting you". MBC. March.2020. `http://content.mbc.co.kr/program/documentary/3479845_64342.html`

2   "The age of immortality". SBS. April.2021. `https://programs.sbs.co.kr/culture/sbsspecial/visualboard/53590?cmd=view&board_no=417660`

Chapter 2
Literature Review

This chapter will cover the most relevant literature and related works that support the topic of this research. This literature and related works led me to consider a new opportunity for continuing bonds in the context of design. Particularly, it allows this research to understand the potential of continuing bonds as one of the tools that contributes to bereavement care and to apply in design study. This chapter will attempt to outline this background research of mainly continuing bonds, also related topics of bereavement, mourning and grief. In addition, this chapter will present related work with technology and design, particularly in the field of HCI, and the background research of the multi-sensory with memory evocation.

2.1. Understanding Continuing Bonds

2.1.1 Definition of Continuing bonds

Continuing bonds is defined as ***"an ongoing inner-relationship"*** between the deceased and the bereaved (Stroebe and Schut 2005, Field et al. 2003), it could be simply stated as love (Klass et al. 2014). The idea of maintaining a connection with a loved one who passed away is a natural instinct and phenomenon for most people who experience bereavement at any stage of their lives (Klass 2006). Continuing bonds may be a comparatively normal component of bereavement (Root and Exline 2014, Klass et al. 2014).

According to a book of "Grief isn't something to get over: Finding a home for memories and emotions after losing a loved one", we continue our bonds with the deceased through our thoughts and memories, and thinking of the deceased is the natural, common and representative way of continuing bonds (Lamia 2022).

Depending on individual and cultural beliefs, the bereaved people can engage in this process of continuing bonds through diverse practices including thinking of the deceased in our minds through physical objects such as the deceased belongings, remembering one's anniversary of death, praying, or maintaining one-sided conversations with a deceased person assuming that they may somehow hear and advise us (Lamia 2022). Talking about the deceased story with someone who was close to the deceased, preserving the deceased person's room or possessions can be all described as different forms of *"continuing bonds"* (Lalande and Bonanno 2006, She et al. 2021).

2.1.2 Discussion of Bereavement, Grief and Mourning

First of all, I would like to describe the history of the perception of death and bereavement. From a perspective that emphasises the philosophy of life in the 20th century, death was considered a subject to be overcome and a point of transition. Systematic research on death began to develop, especially after World War II, focusing on the experience of death, the dying process, and the treatment of the experience of death, with interests arising from anthropology and psychology in a Western academic context. Subsequently, in the 1980s and 1990s, the study of death expanded into ethical and legal domains, and by the 1990s, sociology in the United Kingdom became interested in death (Walter 2015, Inglis 2010). This expansion led to the presentation of various perspectives on death and dying (Walter 2015, Inglis 2010). Therefore, from the 1980s, around the past four decades have seen a growth in theory solving the problems surrounding bereavement, grief and loss by the survivors of the deceased (Kouriatis and Brown 2011). Many researchers are still emphasising the necessity for further research in this specific area (Kouriatis and Brown 2011).

Bereavement is a universal experience and grief naturally follows after loved ones die, and the bereaved try to mourn the deceased loved ones. Each person deals with grief, time and process of mourning differently. Bereavement refers to the physical loss of someone who was loved significantly through death (Stroebe and Schut 2005). Grief refers to a natural response and emotional reaction following profound loss (Neimeyer et al. 2002, Stroebe and Schut 2005). If grief is an emotional reaction, mourning is a process. Mourning refers to a long-term painful

circumstance after a loved one has died (Özel and Özkan 2020), in other words, it can be described as process of restoring the peace of mind that follows after losing a meaningful object of affection (analysis Society 2002). Mourning is known to be mainly related to the death of loved ones, in fact, it refers to a normal response to all meaningful losses. The dominant feelings of mourning are grief and pain. This feeling includes a loss of interest in the world and an immersion in thinking about the lost object (Freud et al. 1917). Some bereaved individuals obsess over the memory of the deceased or the lost object, persisting in the desire for the return of the lost object, which could be considered as "pathological mourning" (Wolfenstein 1966).

The Mainstream Bereavement Theories

This section introduces the mainstream bereavement theories and grief process. Throughout history, various theorists have explored the concept of bereavement, among them Freud. Freud's first conceptualisation of bereavement theory, as outlined in his seminal work "Mourning and Melancholia(1917)", suggests that the grieving process involves a psychological task that individuals must undertake to overcome the loss of a loved one. According to Freud, this process referred to as "grief work", involves the mourner redirecting their emotional energy and attachments from the deceased to other aspects of life. It includes acknowledging the reality of the loss, experiencing the associated emotions, and gradually achieving a detachment from the deceased. Freud proposed that failure to complete this grief work might lead to a condition he termed "melancholia" or pathological mourning (Freud et al. 1917).

John Bowlby who is well-known for "Attachment theory(1969)", was the the first bereavement theorist to base his conclusions on empirical evidence (Wright and Hogan 2008). The attachment theory suggests that emotional bonds have an evolutionary basis and offers a strong foundation for understanding bereavement (Smit 2015). Rando and Kübler presented special models of the process of adapting to loss.

Rando's mourning process is described as six states, known as "sixR's (1993)", grouped into three categories (Rando 1993) (see Table 2.1 on the next page). In terms of the *Phase of the Avoidance* in the Table, this is the early stage of mourn-

ing when we firstly recognise the loss. Rando claims that we will continue to experience emotional avoidance until we complete the first R. The *Confrontation Phase* consists of coping with grief and finding ways to express the complicated feelings. In this stage we experience pain of loss through expressing our emotion and recollecting memories of the deceased. Especially 'Relinquishing old attachments' takes time and is painful. Rando describes this stage of reacting as accepting, identifying and expression of feelings to all the psychological reactions of loss. In this *Phase of Accommodation*, we start to look for meaning of loss and new existence. Rando describes that we could still go through some of the other R's again, such as Recollection or Reaction, yet we could move on at this stage.

Table 2.1 Rando's Three Stage of Mourning, "Six R's" from *Treatment of complicated mourning, by T. A. Rando (1993)*

Avoidance Phase	1) Recognise the loss - Acknowledge the death - Understand the death
Confrontation Phase	2) React to the separation - Experience the pain - Feel, identify, accept and express all psychological reactions to loss - Identify and mourn secondary losses 3) Recollect and re-experience - Review and remember realistically and re-experience the feeling 4) Relinquish old attachments
Accommodation Phase	5) Reinvest - Revise the assumptive world - Develop a new relationship with the deceased - Adopt new ways of being in the world - Form a new identity 6) Readjust

The most well-known and famous cycle of understanding grief, the Elizabeth Kübler-Ross's 'Five Stages of Grief (1969)' describes the standard journey of grief

moving through a linear process of Denial, Anger, Bargaining, Depression and Acceptance (Kübler-Ross 1974) (Figure 2.1).

In more detail, the initial stage of grief is *Denial*. We unconsciously avoid the painful situation at this stage. The feeling then changes to anger. In terms of the stage of *Anger*, it is the state of blaming other and behaving aggressively. At the stage of *Bargaining*, we can start to make deals with ourselves. This indicates that acceptance has begun. *Depression* stage includes the pain and suffering of loss. At this stage, we understand the reality, yet still have grief and longing. Lastly, the stage of *Acceptance*, we accept, allow and adapt to life without the deceased and the new life process begins.

Five Stages of Grief was created through Kübler's observations of over two hundred dying patients, and she applied this cycle to the bereaved. However, very few people who suffer bereavement after the death of a loved one experience a smooth and linear progression through these stages (Maciejewski et al. 2007).
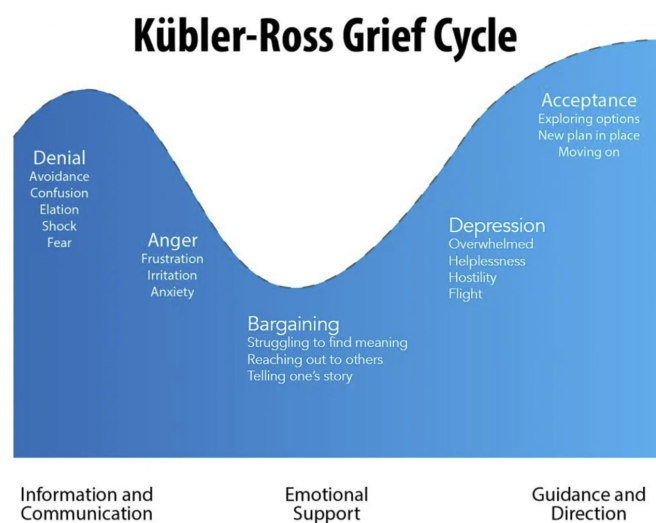
Figure 2.1 Kübler-Ross's 'Five Stages of Grief(1969)' ©*Psycom.net*

In terms of contemporary bereavement theory, Continuing Bonds Theory is commonly attributed to Dennis Klass who is well-known in the field of psychol-

ogy, particularly in the study of bereavement and grief(Klass et al. 2014). Klass
is a licensed psychologist, he has been active in the study of death, dying, and
bereavement since 1968. In his book of "Continuing Bonds: New Understandings
of Grief" was first published in 1996, and it began to gain recognition and promi-
nence in the field of bereavement and psychology during the late 20th century,
particularly in the 1990s. This theory emerged from collaborative efforts within
the field of bereavement psychology and has evolved with contributions from var-
ious researchers and theorists over time. Continuing Bonds Theory challenges the
traditional notion of detachment from the deceased. It suggests that individuals
maintain a bond with the deceased through memories, conversations and actions,
and contributes positively to their grieving process.
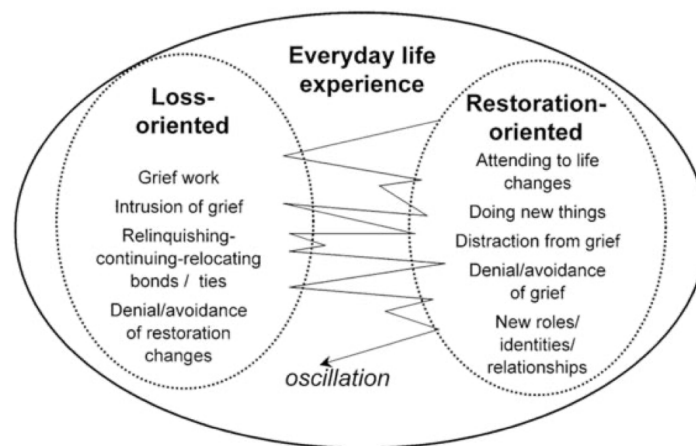
Figure 2.2 'Dual Process Model of Coping with Bereavement(1999)' © *M.S.
Stroebe and H. A. W. Schut 1999*

Margaret Stroebe and Schut introduced the Dual Process Model(DPM)(1999)
of coping with Bereavement (Fiore 2021). It was created first by ruminating on
Freud's 'grief work' theory, then developing away from it. The DPM integrates
elements from stress and coping theories along with existing bereavement theories
to formulate a novel coping model that provides a more precise understanding
of stressors associated with the bereavement process. Following the Figure 2.2,
DPM shows an individual tends to oscillate between two states; 'loss-oriented' and
'restoration-oriented'. 'Loss-oriented' involves experiencing grief and addressing

the emotional pain, and 'restoration-oriented' focuses on practical aspects that demand pushing away thoughts and emotions associated with their loss (Fiore 2021). In fact, it was Worden who initially went against Freud's view of the importance of detachment from the deceased (Worden et al. 2018). However, he later expanded Freud's theory by proposing that individuals could continue to have a bond with the deceased whilst simultaneously continuing with their life (Klass 2006).

Controversial Process of Grief

Margaret Stroebe's article "Cautioning Health-Care Professionals: Bereaved Persons Are Misguided Through the Stages of Grief" focuses on the contradiction within Kübler-Ross's theory (Stroebe 2017). According to the latter's article, grief is a very sensitive process, it couldn't be solely linear. In her article, she also referred to John Bowlby who is a pioneer in 'attachment theory' and who stated that *"These phases in grief cycle are not clear cut, and any one individual may swing for a time back and forth between any two of them"* (Richards 1981). In fact, these limitations led to the formation of the DPM mentioned above. Stroebe and Schut found other limitations in existing grief work models: first, bereaved individuals cope with one stress at a time rather than with multiple stresses; second, there was a lack of evidence supporting the accuracy of the grief work hypothesis in the bereavement experience, and lastly, there was limited applicability of the grief work hypothesis across various cultures and genders. Therefore, in contrast with generalised stage theories as Rando's "Six R's" or Kübler's "5-stage of grief", DPM focuses more on the individual's way of coping, the process of finding meaning and opportunities for personal growth (Fiore 2021).

In this regard, Elizabeth Kübler Ross stated in another book, "On Grief and Grieving: Finding the Meaning of Grief Through the Five Stages of Loss (2005)", "The stages were never meant to tuck messy emotions into neat packages. They are responses to loss that many people have, but there is not a typical response to loss, as there is no typical loss. Our grief is as individual as our lives" (Kübler-Ross and Kessler 2005). In fact, Neimeyer et al. noted that 506 young adults experienced complicated grief in the first two years of bereavement (Neimeyer et al. 2006). This occurrence was higher when the reason for death was an unexpected accident,

suicide, homicide or early death (Neimeyer et al. 2006).

Regardless of the specific reason, if the death of a loved one is difficult to accept, the bereaved person's grief is generally more severe and the period of suffering longer (Fujisawa et al. 2010), and many bereaved people remain trapped in cycles of grief and regret. Some bereaved people can suffer from physical illness(Stroebe and Stroebe 1987) or 'Complicated Grief Disorder (CGD)' (Golden et al. 2007). Further, although after experiencing loss, the bereaved can move on from distress and continue their lives without the deceased person, moments of longing and grief are likely to occur even after more than 10 years from the original loss (Freidman and James 2008, Klass et al. 2014, Meichsner et al. 2020). Moreover, it is often reported in psychological studies that one of the major causes of distress that the patient experience is passing through complex mourning period (Stroebe et al. 2006). Among the pathological mourning reactions, some defensively do not mourn the deceased or some extend the period of mourning which means extend their grief. Volkan noted that this is an attempt to perpetuate the internal representation of a lost one through connection with the lost one(Volkan 1981), and the American Psychiatric Association named this symptom a persistent complex bereavement disorder(PCBD)(Association et al. 1994).

2.1.3 The Role of Continuing Bonds

From the perspective above, therefore, bereavement theory has broadened beyond psychology analysis to explore the potential usefulness of grief care. According to literature from psychology and psychiatry, "continuing bonds" can be leveraged by bereaved people to move forward from their loss and grief (Field et al. 2003, Klass et al. 2014). Maintaining continuing bonds is natural phenomenon and often represents a positive mechanism for engaging with remembrance and process grief and mourning (Klass 2006). The theory of Field and his team (Field et al. 1999) describes the phenomenon of continuing bonds as an 'approach' orientation, yet this assumes that the bereaved welcome and desire continuing bond experiences. In other words, continuing bonds need to be seen in terms of whether this ongoingness with the deceased are adaptive, in terms of coping with grief and mental well-being (Root and Exline 2014). For instance, continuing bonds is basically thinking of the deceased, but the feeling of loss, grief and guilt can also be elicited

when remembering a deceased person, in which case engaging in a continuing bond can cause the bereaved person additional distress (Root and Exline 2014).

This phenomenon is especially evident in situations where the "pre-death relationship" between the bereaved and the deceased was problematic, which can lead to additional negative feelings and deeper trauma (Field et al. 2003, Hewson et al. 2023). In contrast, if the relationship with the deceased was strong before he/she died, the intensity of grief is also stronger. Therefore, the dominant theory in the past said that maintaining a bond was evidence of pathological grief. Some theorists even said it was the cause of pathological grief (Klass et al. 2014). This section will describe details of barriers regarding continuing bonds and the perception of continuing bonds in past and present.

Pre-death Relationship and Barriers of Continuing Bonds

"Pre-death relationship" has potential implications for the bereaved people which can be helpful or detrimental when coping with the grief and loss that perpetuate continuing bonds. As the definition of continuing bonds is an ongoing inner relationship with the deceased (Stroebe and Schut 2005, Field et al. 2003), this means that diverse experiences are created in interactions between the deceased and the bereaved which are not restricted to affirmatively perceived experience. This means that continuing bonds may also become unwelcome and avoidance occurs (Root and Exline 2014). According to the book of "Death Studies: The Role of Continuing Bonds in Coping With Grief" is still controversial, yet the theory and measurement of existing continuing bonds tend to assume that the pre-death relationship was satisfying (Root and Exline 2014).

In fact, it is true that some researches indicate anger and blame directed towards the deceased post-loss that tend to frustrate the continuing bonds (Field et al. 2003). In particular, if the cause of death was an unexpected accident such as disaster, suicide or homicide etc, the bereaved avoid maintaining continuing bonds (Neimeyer et al. 2006, Root and Exline 2014). Moreover, if the bereaved do not feel nor express support or acceptance socially, culturally, continuing bonds may not be effective in dealing with their grief and mourning (Tyson-Rawson 2014). If the bereaved fear that their continuing bonds with the deceased will be criticized or rejected by others such as friends and family members, the

bereaved may feel limited in maintaining continuing bonds or feel distress. Thus empathy and sympathy from others are important during continuing bonds (Root and Exline 2014).

Past Versus Present of Bereavement Theory

As presented above through the mainstream bereavement theories, early work on grief suggested that bereaved individuals would benefit from detaching themselves from their loss (Stroebe and Stroebe 1991). Bowlby said that some of the bereaved who have strong continuing bonds but cannot accept the loss of the deceased could experience huge distress of loss. Alternatively, someone who is grieving and attempting to maintain the relationship with the deceased may suffer (Bowlby 1980). Hence, the past experts from 1920s to 1980s on grief suggested that the bereaved be focused on memories of the deceased; the reality of their loss and that they should be indifferent to them. For example, Freud's past pre-dominant grief theories emphasized the primary task of bereavement is to detach from the deceased loved one and bonds should be severed (Freud et al. 1917). A parallel view of successful mourning from Volkan was that the bereaved must detach from the deceased and their past (Stroebe and Stroebe 1991).

In contrast, within contemporary studies, continuing bonds is a common aspect of bereavement in psychiatric and psychological literature. Many researchers of bereavement accepted that continuing bonds have a positive effect on the bereaveds' ongoing lives (Klass et al. 2014). Further, many studies verified that continuing bonds benefit the bereaved in emotional ways, such as in terms of comfort, yet other results showed that the bereaved felt it difficult to create a bond with the deceased. In this way, contemporary studies take a more nuanced perspective that sees continuing bonds as a way to support meaning making after death and, although not universally viable, if adequately supported, they can also help with conflict resolution and promote benefits ranging from comfort to self-determination (Klass et al. 2014, Hewson et al. 2023). Massimi and Baecker emphasise that grief is not a problem to be solved, but a process we live through and something that radically changes a person's world-view. Moreover, although the deceased has passed away, their relationship with the bereaved person changes but does not die (Massimi and Baecker 2011).

Ultimately, a bond is part of normal mourning process, it is important to accept that the emotion of grief is part of continuing bonds. Continuing bonds experience can be positive or negative within the mourning process, it depends on the bereaved situation with the deceased and others, as well as on social and cultural considerations (Lalande and Bonanno 2006). The importance of continuing bonds does not evoke remembrance of the deceased, but also in the re-elaboration of the present. This can occur as a result of a process that helps to find meaning in loss (Klass et al. 2014), or to reconsider the new relationship with the deceased (Stroebe and Schut 2005). Therefore, 'continuing bonds theory' in "Death Studies" (Klass 2006) notes that the importance is to evaluate the bereaveds' personal expressions of experiences and emotions related to continuing bonds. The latter may be difficult to define clearly due to diverse expressions of continuing bonds experience. However, understanding the role of continuing bonds needs to be categorised through different cases of continuing bonds and need to be compared in order to establish further finding the relationship between the deceased and the bereaved (Root and Exline 2014).

2.1.4 Mourning from a Cultural Aspect

Death is inevitable, thus it is easy to find diverse funerals and bereavement rituals as well as wide range of mourning rituals within all cultures (Irish et al. 2014, Romanoff 1998). This section will present the culture of mourning and bonding in representative countries of West and East, with a focus on Japan and South Korea. This is because firstly, most research in bereavement focuses on western culture, therefore a study of East Asia's rituals of death and mourning can expand the field. Secondly my nationality is South Korean while I study in Japan, which means that I have a greater degree of familiarity with these cultures, thus I can attempt to grasp the mourning characteristics for these two countries.

United Kingdom

In Western countries, for instance, there are no officially recognized rituals of grieving in the United States, and what constitutes "proper" mourning behavior is unclear (Bolton and Camp 1987) because bereavement practices in US may be in-

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fluenced by Pop-culture and modernism (Klass et al. 2014, McGoldrick et al. 1991), yet the United Kingdom had traditions, customs and rituals of grieving, and they are still continuing today as shown in those that date back to the Victorian period. 'Memento Mori photography' (Blood and Cacciatore 2014) and 'Mourning Jewellery'(Holm 2004) are beautiful though somewhat creepy cultures of mourning (Figure 2.3).

Figure 2.3 Left: 'Memento Mori photography', ©*V&A* Right: 'Mourning Jewellery' Late 18th century, ©*V&A*

'Memento Mori photography' is the deceased were posed to look alive, and sometimes eyes would be painted on after the photo was printed. The bereaved sometimes took a photo together with the deceased. This was one way to preserve their memory of the deceased in the Victorian period. 'Mourning Jewellery', including earrings, brooches, and lockets, forms another culture of preserving and mourning the deceased that occurred between 1837 and 1901 in the UK (Holm 2004). It was created with the hair of a deceased person, and women wore them close to their heart to keep their loved ones beside them as continuing bonds. Moreover, they put phrases of "in memory of", "lost but not forgotten", into designs, it became more than just a symbol of mourning over time, it also became fashionable (Wildgoose 2018).

This culture of mourning is remarkable during the Queen Victorian period and was prompted maybe by the queen's own prolonged grief over the death of her husband, Prince Albert. In particular, among the upper classes in the UK and

Figure 2.4 Mourning Dress, ©*V&A*

France, women were more obligated than men to follow mourning practices included using black crepe veils and wearing bulky, concealing black clothing (Figure 2.4). With these outfits, special black crowns and bonnets were worn. It was called "Victorian mourning dress". Widows were expected to wear mourning dress up to four years after the loved ones died (Bedikian 2008). A mourning dress, mourning jewellery and memento mori photography in the Victorian era were all shown to show grief and continuing bonds between the deceased and the bereaved through practices. Yet, as industrialisation made people move from country to town and from Europe to America, this situation made mourning practices from traditional funeral practices simpler (Walter 2005). In contemporary times, when a person dies, his/her family members, friends and relatives still sometimes follow the tradition of wearing black clothes. Females wear black dresses, males wear black suite in funeral, yet it is not mandatory that they should wear after funeral or over one or two years. In the UK's modern society, they consider meaningful ways to make personal contributions through their own specific beliefs or religion in funerals. After a funeral, family members host at the house of the deceased for a ceremony which resembles a modest celebration of the deceased to honor the life

of the departed. Mourners participate in the occasion and talk about old stories of the deceased to share the memories of the deceased when he/she was alive while eating and drinking (Holloway et al. 2013). It is more casual way of mourning the deceased without any traditional way of ritual or procedure, but people accept the death as a part of our lives. Their continuing bonds with the deceased are also diverse and they have their own way of collecting deceased photos, belongings or specific beliefs and religion.

Japan

In terms of history, the culture of death in Japan has not been only a personal matter but also a familial, communal matter for many thousands of years (Kimura 1991). Some regions of Japan still retain a traditional culture of death, for instance, this is one of ritual that there is one ritual in which, when a member of the family dies, the family lets his or her dead body 'sleep' one night at home. After the funeral, they keep Buddhist Family Altar(Butsudan) at home and pray for them (Klass 2014). It is typical, even for families who are not Buddhist, to sit in front of a Buddhist altar to mourn their relatives while facing a picture of them and in the presence of incense and the mortuary tablet. This is the traditional Japanese ritual of mourning (Figure 2.5), and it is said that even though members of the family think that their soul still lives together with them. The ideas expressed in Zen-Buddhism include principles such as "accept death as it is" and an "eternal cycle of birth, death, and rebirth": these are key motifs that are totally integrated into their lives (Suzuki 1991).

To amplify this background, Japan is the fastest-aging population in the world with the greatest percentage of elderly people aged over 65; an estimated 36.23 million in The World Economic Forum's Future of Jobs Report, September 2023. [1]. Many elderly people are traditionally taken care of by family members when they died however, family sizes have decreased and it is becoming less common for children to remain in the same household as their parents, usually they live away from each other. In addition, the meaning of 'Oku' in Buddhism is an intersection of the sacred and the profane, and this intersection point is represented by the Buddhist altar in the house (Rambelli 2010). However, a contemporary house in Japan, especially in Tokyo lacks a traditional structure and it is difficult to

represent this concept of Oku within the small and compact apartment of modern settings (Uriu and Odom 2016). The meaning of oku has also changed over time, moving from the ancient "depth" to a more modern notion of unpleasant "darkness." (Rambelli 2010).

Figure 2.5 Participant*D,E*'s Buddhist altar in Japan

On the other hand, the perception and attitude toward death and mourning became acute due to the impact of "The Tohoku earthquake" on 11 March 2011. The earthquake and tsunami in Tohoku region of Japan, with a magnitude 9.0 killed more than 15,000 people, and more than 2,600 people were missing (Yamamoto et al. 2015). 230 mental health professionals took part in a mission to relieve trauma, yet the trauma is still ongoing for the bereaved people in Japan (Tominaga et al. 2020). For this reason, the importance of grief care, bereavement care, and preparing for death were became more common among the general public and society. These social disasters influenced the "Shukatsu" movement, and the perception and attitude toward death and grief in Japan have been advanced.

The meaning of "Shukatsu" is 'job hunting', yet the older generation changes the Chinese character of "Shu" to communicate a different activity as "preparing for end-of-life"(Duangkaew and Tangchitnusorn 2021) [2]. This new word became famous in Japan, especially in 2012, when the 'Ministry of Economy, Trade and Industry' is noted that the word of Shukatsu was selected as the year's buz-

zword (Duangkaew and Tangchitnusorn 2021). Thus, many events using this word were held nationwide, such as "Shukatsu Festival" or "Shukatsu EXPO". In particular, the market of end-of-life is recently growing due to COVID-19 [3]. At these fairs, people are able to sample their own funeral and get an experience of their last moments. For example, people lie down in a coffin, try to think of their own funeral and death. These fairs also offer an opportunity for people to think about how to sort their belongings out after death, and write down the 'Ending Notes'. Throughout writing 'Ending Notes', people can recap their lives and record their practicalities of dying including after-death messages to families and friends and their decisions on their end of life in hospital such as CPR and funeral services (Duangkaew and Tangchitnusorn 2021) [4].

Apart from end-of-life services, Japanese people are also interested in how to mourn the deceased in a manner separate from Zen-Buddhism culture. Buddhist artefacts still contribute to the creation and preservation of the overall symbolism of mourning and society in Japan, but smaller altars or other objects such as jewellery have appeared in the modern Japanese market (Rambelli 2010, Uriu and Odom 2016).

South Korea

The "mourning for three years" is the oldest ritual of the ancient Chinese mourning system. Confucius established the designated mourning time as three-years: this is the Confucius' way of respecting the deceased (Dan 2014, Sarkissian 2010). Confucianism was never in charge of death-related rituals in Japan (SoHee 2017), whereas Korean ancestors under the influence of Confucianism followed the spirit of mourning the deceased for three years (Landis 1896). In particular, throughout the Joseon Dynasty in Korea, it was widely practiced to establish a small house called "Yeo-mak" next to the grave of the deceased parents and to protect the grave for three years. It was recommended to use this practice at the national level of Joseon (Yu-ri 2017). Entering the modern era, the Korean society started to simplify the mourning practice, thus, three-year mourning is hard to find in recent times, yet the Confucian style is still the most common practice in South Korea, and is recognised as belonging to traditional rituals such as funeral rites and 'Jae-sa' [5]. South Korea has an anniversary of one's death, part of Koreans

ancestral rites, which are called 'Jae-sa'. This ritual treats the deceased as if they are alive, for example the offspring and family members serve fresh foods, transfer a spoon and chopsticks from one kind of food to the other food. After finishing Jae-sa, the ritual is ended by burning a paper of the name of the deceased in the tablet (Figure 2.6).

Figure 2.6 Participant *Min*'s photo of Jae-sa & Ritual of burning a paper in the tablet in South Korea

The Japanese seem to live with the deceased through the Buddhist altar and to preserve the deceased belongings. Of particular importance is "Katami" which is treated carefully because it is believed that the deceased soul is embedded in it (Karasawa 2020). Moreover, while offspring naturally use the possessions from the deceased in Japan, the deceased's belongings are generally not preserved in Korea except in special cases (Kyung-taek 2003). In addition, when a person dies, family members traditionally burn the deceased's belongings such as clothes, shoes, bags, books etc in South Korea. This ritual may be related to Shamanism or Buddhism and cremation because the culture of death in Korea has been much influenced by not only Confucianism, but also Buddhism, Taoism and Shamanism (Mills 2007, Bok-gyu 2013).

The meaning of this ritual is firstly, to respect the deceased's last moments and

secondly, the bereaved hopes that the deceased will forget all the pain and sadness in the present world and 'go back' to heaven as the ashes go up to the sky. Lastly, incineration supports bereaved people to move on from the death of a deceased person towards the next steps in their lives and back to the reality (Soo-hyun et al. 2013) [6].

In terms of language to express the death in South Korea, Korean people say 'Doragada' if a person die. It means 'go back' in English. The meaning of incineration is related to the word of 'Doragada' (Soo-hyun et al. 2013). Further, there is an interpretation that the meaning of 'doragada' is a metaphorical expression preferred to "die" because death is negative and goes against the shamanic view (Sang-woo 2007). Due to this cultural impact, South Koreans have adopted a negative perspective towards preserving the deceased belongings.

In addition, there were superstitions there were passed down from ancient times due to the shamanic view of death (Sang-woo 2007), for instance, if we keep the deceased's belongings, a harmful spirit could come in, or if you talk about death, you are going to die, or if you write your name in red, your parents will die etc (Campbell et al. 2018). This social phenomenon still influence after someone dies today. People miss the deceased loved ones, yet they are reluctant to keep the deceased belongings. The book of 'Tears of the Old people: The Manshi (meaning 'poetry of mourning') Story of Joseon(2008) (SongYeol 2008)' also notes that if the bereaved family has too strong a grief, the deceased cannot leave for heaven and will wander in this world. This social convention or culture may push people not to express their grief in South Korea.

2.1.5 Continuing Bonds in the Context of Design

The contemporary literature shows that continuing bonds is a natural emotional response when we lose loved ones and can be a leverage for coping with grief in ordinary bereavement. For this reason, one of the ways in which design research including Human Computer Interaction (HCI) can seek to support the experiences of bereaved people is to facilitate continuing bonds between the deceased and the bereaved (Gulotta et al. 2016, Odom et al. 2010). However, there is still lack of research into continuing bonds in the context of design (Albers et al. 2023).

According to the paper "Dealing with death in design: developing systems for

the bereaved" (Massimi and Baecker 2011), the authors suggest that "Designers could offer the bereaved people the opportunity to create, personalise, and build a meaningful artefact", and it could be digital or physical. Further, the key process identified by the authors to support the bereaved to maintain an ongoing relationship with the deceased is storytelling such as recalling good memories of the deceased, and trying to understand why the death happened (Massimi and Baecker 2011). Moreover, in psychotherapy, objects related to the deceased such as photos, dolls or audio recordings help create a sense of intimacy with the deceased, and aid patients in the process of expressing themselves and talking to the deceased (Worden et al. 2018).

Then, how can I create thoughtful design with the bereaved people and encourage them to tell stories through continuing bonds?

A key example is Wendy Moncur and her team's project called "*StoryShell*" (Moncur et al. 2015)(Figure 2.7 below). *StoryShell* is a tangible memorial artefact using digital photography that allows a bereaved parent to curate photos of a deceased child as a bespoke. It also allows the bereaved to input stories of the deceased child within the context of society. This project used a deep and iterative participatory design approach to create the artefact with one bereaved mother "Mayra". The authors worked intensively with her undertaking six interviews across 13 weeks. This process allowed her to capture the feeling of loss and longing, to understand her story and to create a bespoke and unique product for mourning. The goal of this project was to create an opportunity to share detailed memories of the deceased child with family and friends, honouring and maintaining continuing bonds.

Another key example is Jayne Wallace et al.'s project called "*ReFind*" (Wallace et al. 2020)(Figure 2.7 Left). *ReFind*[7] is a handheld artefact, which allows the bereaved to curate and create digital photos for continuing bonds with the deceased loved ones through the idea of ongoingness as a way to re-define the relationship. The research used an "autoethnographic design" as a method: the first author lived with the *ReFind* for 10 weeks, observing and recording expectations and limitations.

Another study based on Continuing Bonds theory is Getty and team's study that analysed the role of the popular SNS Facebook as a memorial for grieving
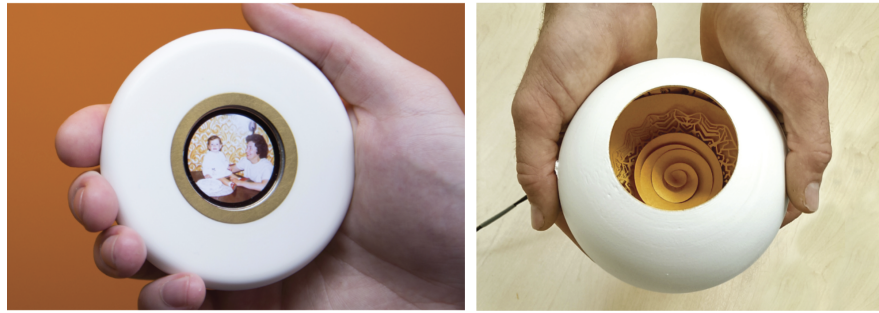
Figure 2.7   Artefact of Continuing Bonds (Left: 'ReFind', © *Wallace*, Right: 'StoryShell', © *Wendy*)

and continuing bonds (Getty et al. 2011). In addition, Grace's study explores how bereaved people are reminded of their deceased loved ones and maintain continuing bonds through "Mobile Life Logging" technologies which allow the bereaved to capture and to preserve memorable moments (Ataguba 2018). Ju Yeon et al.'s study conducted interviews with 17 parents who had lost a child to explore how they engage with the content of photos, such as colour combinations and facial expressions for their ongoingness with the deceased child. This particular focus was because existing studies in HCI only use photos of contexts such as time and place to support bereaved continuing bonds. By meaning-making processes of interactions with the content and context of photos, this study allows possibilities for broader ways of using photos for continuing bonds (Jung et al. 2023).

2.2. Technology with Bereavement

Technology cannot "solve" grief, but using technology can provide bereaved people with an "alternative" for coping with grief when they face bereavement. In this section, I explore related works in Human Computer Interaction(HCI) that involve technology in relation to the multi-sensory, especially smell and sound, and memory evocation. I also introduce the ethical considerations and possible detriments of using technology.

2.2.1 AI, VR and Digital Avatar

A South Korean documentary called "Meeting you"(Figure 2.8) from 2020 showed a deceased daughter called Na-yeon replicated in 3D who has a reunion with her mother in a VR environment (Stein 2021). The mother had lost Na-yeon three years ago after turned seven. She still regretted not saying her last goodbyes to Na-yeon, and was afraid that Na-yeon's memory would fade. The Japanese broadcast station, NHK tried to replicate the deceased person in 3D earlier than Korea in 2019 [8]. The program called "Fukkatsu no hi (Day of Reunion)" showed a reunion between Tetsuro Degawa who is an actor in Japan and his mother who had passed away eight years previously. The production team used digital technology to recreate the deceased. In addition, a British robotics scientist, Dr. Peter Scott-Morgan made himself into a cyborg. Dr. Peter Scott-Morgan had been diagnosed with Motor Neurone disease (MND), and he was given five years to live. However, he wasn't frustrated and decided to use himself as his study; a human cyborg. The first full cyborg, Peter 2.0 had been created [9]. He created an avatar of his face to allow him to indicate a greater range of expressions. He had many operations and wrote a book called "Peter 2.0" about the experience, for example, he used eye-tracking technology for typing and he could stand up by using his special wheelchair (Aylett et al. 2022).

Figure 2.8 VR and Digital Avatar from documentary of Meeting You ©*MBC*

2.2.2 Bereavement and Mourning in HCI

In 2009, Massimi and Charise were pioneers in encouraging the HCI community to incorporate the concepts of mortality into research and practices. They introduced

the specific word of 'Thanatosensitivity' to describe technologies and approaches
in HCI that integrate the idea of death into the design and research of how humans
interact with both physical and digital devices (Massimi and Charise 2009). The
concept of 'Thanatosensitivity' raises several questions, some of which are related
to digital legacies after death (Gach and Brubaker 2021, Maciel et al. 2015, Mon-
cur et al. 2012). These questions revolve around who should have access to these
legacies and also involve efforts to establish research and design guidelines for
working with bereaved participants. These guidelines include comprehending the
role, risks and limitations of technology as well as adjusting timelines and meth-
ods to align with the specific needs of individuals (Massimi and Baecker 2011, Sas
et al. 2016, Uriu et al. 2021). Further, Massimi and Baecker (Massimi and
Baecker 2011) highlighted key processes of "making and storytelling" to assist
bereaved participants in coping with grief and preserving their relationships with
the deceased.

The systematic review published at CHI 2023 by Albers et al. analysed 107
relevant papers related to death and bereavement, categorising their contributions
into three areas: digital remains, remembrance and coping (Albers et al. 2023).
For the bereaved, "digital remains" represent both an inheritance and a legacy,
embodying not only who the deceased person was but also the relationship that
existed between the two. On the other hand, "remembrance" encompasses both
the practice of looking back on the past to honor the deceased person and the
bond shared with the bereaved, as well as grieving for what death took away.
Finally, "coping" illustrates the practices that allow individuals to face death and
move on after it, including social support, sense-making, and letting go.

Researchers who developed "*Anekdota*" created a handheld metadata detector
that enables bereaved individuals to explore a deceased person's location data.
They also utilized Research through Design (RtD) to understand how these traces
of daily life, generated through technological interactions, could be incorporated
into the context of design (Jørgensen and Jenkins 2023). In addition to physi-
cal artefacts, there is a body of research exploring the utilisation of digital tools
in the context of bereavement. Anna et al.'s investigation, as described in their
study (Figure 2.9 Left), aimed to harness the potential of AI in aiding coping
with grief (Xygkou et al. 2023). They conducted semi-structured interviews with

10 bereaved individuals to explore how ongoing relationships with Chatbots influenced their grief experience. According to the participants, the role of the Chatbot varied based on their individual needs and the specific characteristics of the technology. Some found the Chatbot to be a supportive listener, a representation of the deceased or an emotional support. Despite the limitations and shortcomings of the Chatbot, it was regarded as a means to supplement connections with others and oneself. Another study of Häkkilä et al. developed an interactive gravestone that acts as a physical memorial which can display different contents based on RFID (Figure 2.9 Middle). The different contents comprise diverse stories of the deceased offered to the mourners (Häkkilä et al. 2019).

Last but not least, the "*Fenestra*", designed by Daisuke Uriu et al., reinterprets Japanese mourning culture to offer a modern approach for the 'memorialisation' of departed family members(Figure 2.9 Right). Traditionally, offspring would meet their deceased grandparents at home with a traditional Buddhist altar. However, using *Fenestra*, lighting a candle in the candle holder activates its main interactive feature, and when family members gaze into the round mirror, digital portraits of the deceased are displayed, allowing them to maintain a connection with their departed loved ones within the comfort of their home. Uriu et al. proposed that *Fenestra* could represent a modernised ritual compared to the traditional Buddhist altar (Uriu and Odom 2016).

Figure 2.9 HCI design in Thanatosensitivity (Left: Chatbot, ©*Anna*, Middle: Gravestone, ©*Häkkilä*, Right: Fenestra ©*Uriu*)

Overall, existing studies appear to emphasise a single sensory channel, particularly the visual aspect, to evoke a sense of connection and remembrance among bereaved individuals. However, in the following section, I explore how the evocation of memories involves more complex multi-sensory aspects that should be considered in the design of Thanatosensitive artefacts.

2.2.3 Ethical Considerations with Technology in Bereavement

The previously mentioned the documentary called "The Age of Immortality: Mechanical Man–Cyborg and Digital Twin(2021)" in Chapter 1. Introduction, depicted the uncomfortable feelings of a man who had lost his wife when he first encountered his deceased wife's avatar. He couldn't feel his wife's presence from the avatar and he was certain that his daughters would never feel their mother's presence through this avatar. In addition, the audience's reaction to "Meeting You(2020)" was similar; it was perceived as overly artificial, unnatural, and tearjerking. These circumstances can be described as the 'Uncanny Valley effect' (Mori et al. 2012), a term coined by Masahiro Mori in 1970, which refers to the feeling of discomfort and creepiness when we encounter something that closely resembles a human but isn't exactly the same.

Furthermore, numerous studies conducted by scientific and medical professionals have raised concerns about the potentially detrimental psychological impact of intense grief experiences in VR on the bereaved. Although Na-yeon's mother in "Meeting You" was satisfied with the VR experience immediately after, no one knows the potential for long-term consequences (Pizzoli et al. 2021). Experts warn that such intense grief experiences in VR may lead to side effects, such as Post-Traumatic Stress Disorder(PTSD), additional trauma or addiction to seeking emotional relief from avatars. The stage of grief and personal vulnerabilities should be carefully assessed and managed using different methods (Boelen et al. 2007). Stepanova et al.'s paper suggests the attitude of designers when they design using technology (Redstrom 2017). Careless technology design, despite good intentions, can result in undesired outcomes (Gray et al. 2018), and the use of products always evolves with users, so that designers can never completely

control how our products are used. Therefore, it is highlighted that researchers and designers need to move beyond focusing on user experience and contemplate the broader spectrum of human experience, particularly considering the human condition (Stepanova et al. 2022).

2.3. Multi-sensory and Memory Evocation

Many HCI researchers have explored various approaches to facilitate memory evocation that supports connections between individuals by utilising different sensory channels (Czech et al. 2020, Gibson et al. 2023a, Uriu et al. 2018a, Petrelli et al. 2016). In a recent study, Gibson et al. explored the use of a Memory Machine as a technological tool. Participants could utilize this tool to exchange digital gifts in the form of autobiographical collages containing images and various visual media (Gibson et al. 2023a). Further, a similar study, Gibson et al. explored the role of gift giving rituals in triggering nostalgia by leveraging hybrid gifts that incorporate both physical and digital elements. They used chocolates, a traditional gift that have taste, smell and beautiful shapes (Gibson et al. 2023b). The gift of Chocolates was accompanied by a QR code that recipients could scan to access nostalgic photos and text messages. The participants in these studies included friends, partners or children and parents who aimed to discover new ways to share meaningful memories with each other.

The process of storytelling, legacy creation, and preservation from both studies provided opportunities for both gift givers and receivers to engage in reflection, nostalgia, and reminiscence. While neither study specifically focused on the bereaved, they both help to understand how visual imagery and ordinary objects can be combined to support memory evocation and nostalgia (Gibson et al. 2023b, Gibson et al. 2023a).

2.3.1 Olfactory Experience and Memory

The sense of smell is likely one of the most easily connected to our memories and the process of remembrance (Uriu et al. 2018b, Brianza et al. 2022, Dobbelstein et al. 2017). The famous *Proust phenomenon* notes that smells can be leveraged to spontaneously evoke highly vivid autobiographical memories. Further, olfactory

memories are more strongly associated with emotional responses and nostalgic feelings (Chu and Downes 2000). In the novel *Involuntary memory* Proust, vividly recalled childhood memories triggered by the smell of a tea-soaked pastry (Eysenck and Keane 2015).

The study by Garcia-Hernandez 2016 explored which object could evoke stronger memories amongst 50 parents who had lost their children. Parents could vividly recall specific memories when smelling their children's favourite foods or scents from places associated with them (Garcia-Hernandez et al. 2016). More recently, Brianza et al. examined the emotional effect on memories and body images as a result of the use of a probe package called "*QuintEssence*" containing three different scents - lemon, peppermint, and cinnamon (Brianza et al. 2022). Results from the study showed that lemon and peppermint were associated with more concrete memories, as well as personal memory associations, in the case of peppermint. On the other hand, cinnamon was associated with more blurred memories (Brianza et al. 2022). Another project is the "Smell a Memory Kit (Figure 2.10)" by Givaudan in 2013, Singapore [10]. Givaudan is a fragrance house based in Paris, specialising in crafting scents for perfumes, personal care products and household brands. Perfumers at Givaudan have developed therapy kits containing custom-created scents designed for individual patients with Alzheimer's disease. These scents are tailored to the patients' family history, ethnicity, age, and life stories. They offer bespoke fragrances to assist Alzheimer's patients in recollecting their memories.

2.3.2 Auditory Experience and Memory

Numerous studies have shown how both positive and negative emotions can be elicited by leveraging particular sounds in different contexts (Campbell et al. 2019). In particular, music associated with autobiographical memories of an event can serve as a powerful trigger for nostalgia (Juslin 2013). In a survey conducted by Massimi and Baecker in 2010, twenty-nine percent of the forty-one respondents identified both musical and non-musical sounds as valuable tools for reminiscing about a deceased person. Likewise, when assessing the Memory Tree developed by Jayarante, participants emphasized how specific sounds had the ability to trigger more personalised memories compared to visual images (Jayaratne 2016).

Figure 2.10 'Smell a Memory' kits, ©*Courtesy of Givaudan*

Sounds also have been described as a creative and subtle way for stimulating reminiscence and triggering memories (Dib et al. 2010). For example, individuals with Alzheimer's disease often preserve almost intact memories of familiar popular tunes, this circumstance shows the profound connection between sound and memory (Hsieh et al. 2011). Therefore, auditory experiences are often employed in reminiscence therapy for mental health conditions (Campbell et al. 2019).

In addition, Hiroshi Ishii 's lab project "*TeleAbsence* (Figure 2.11)" focuses on connecting the bereaved people with their deceased loved ones using 'tangible memory'[11]. This project shows utilising tangible objects, including typewriters, telephones, and pianos that had once been touched and marked by the hand of the deceased. By combining these objects with the sounds of typing and voices from telephones through technology, the project helps the bereaved individuals interact with an 'illusion' of the deceased.

2.3.3 Effect of Heartbeat Stimulation

It is widely known that consistent stimuli of the heartbeat heard from the mother's womb provide a sense of calmness and mental stability, and hearing someone's heartbeat can foster empathy and connection (Winters et al. 2021). In this context, I was able to find various studies in HCI research that utilize heartbeats for
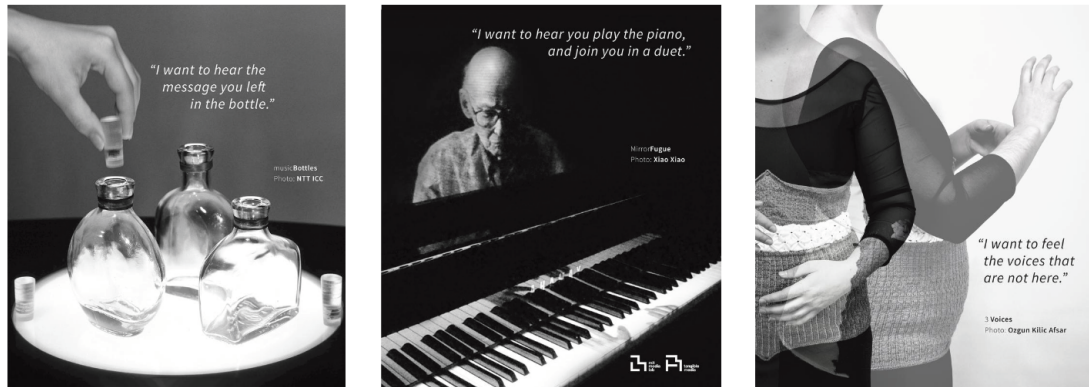
Figure 2.11 Hiroshi Ishii through tangible memories, ©*Ozgun Kilic Afsar*

investigation.

One of the studies called "*Intimate Heartbeats*" (Janssen et al. 2010) investigated the possibilities of leveraging heartbeat to support emotional connection. Results showed that the perception of the heartbeat in an immersive VR environment influenced social behaviours, creating a sense of connection with others, particularly when individuals could associate the heartbeat with a specific person. In addition, a study on "The Calming Effect of Heartbeat Vibration" (Zhou et al. 2020) investigated the role of heartbeat stimulation compared to sound in more detail. It explored the impact of haptic heartbeat feedback on physiological relaxation by measuring heart rate variability. The results indicated that the vibration influenced heart rate variability, leading to physiological relaxation, yet the sound of the heartbeat did not have a similar effect. Eriksson et al. introduced "*HeartBeats*" (Eriksson and Hansen 2017), a haptic device designed to replicate a deceased person's heartbeat using heart rate data from health applications. This device is activated by placing it inside a pillow, allowing a person to listen to their loved one's heartbeat when they hug the pillow, creating a private and intimate sensation.

Further, Howell et al.'s work suggested "*The Heart Sounds Bench*" which records the heartbeats of seated individuals, fostering relaxation, contemplation, and recognition of others' life experiences in public spaces. In a study involving 19 participants, they felt connected to shared heartbeats and the environment. They also perceived the heart sounds as intimate yet anonymous (Howell et al. 2019).

There were also experimental studies focusing on the owner of heartbeat. The study of Ando et al., "*Empathetic Heartbeat*" (Figure 2.12 Left) is related to similar study in which participants hear their own heartbeat using a stethoscope and headphones. Participants empathised with the people in the video through an assumption that they could hear their own heartbeat but in fact, it was not theirs but a part of the video recording (Ando et al. 2012). The result shows that people cannot distinguish between their own heartbeat and others' heartbeats, which gives rise to the understanding that any heartbeat, so that heartbeat can be shared and become a medium for feeling empathy with others around us. Another study of Xu et al. showed that when participants received haptic stimulation simulating their slowed-down heartbeat. They believed that the altered slowed-down heart rate was their own, and even felt less anxious and distress (Xu et al. 2021).

In addition, even though a heart rate is identical, it can evoke significantly different emotional states in different individuals. This disparity arises not only due to individual differences in physiology but also due to other contextual factors (Stepanova et al. 2022). For instance, each person has varying ranges of comfortable breathing rates. According to Stepanova et al.'s paper, while a slow breathing rate of 6 breaths per minute might facilitate relaxation in some participants, it could be excessively slow for others, leading to feelings of anxiety. This experiment resulted in finding that people cannot recognise their own heartbeat, and a slowed-down heartbeat can influence people's emotion enabling them to be calmer and less anxious. Lastly, there is an interesting toy, "*Sleep Dreamer*"(Figure 2.12 Right) [12] which is selling in Amazon, for helping the baby to go to sleep sooner and comfortably. This toy uses the actual recorded heartbeat of the mother, making it highly effective in helping babies sleep by reminding them of the soothing serenity of their mother's womb.

The soothing and concentration-enhancing effects of heartbeat stimulation are due to the repetitive stimuli, and in fact the repetitive haptic stimuli are also used in psychotherapy. EMDR(Eye Movement Desensitization Reprocessing) is a proven affective psychotherapy using bilateral stimulation, psychiatrists often use this treatment for patients who have flashback, depression, sudden death of family member etc (Solomon 2018). EMDR therapy involves the patient recalling fragmented painful memories while simultaneously being provided with bilateral

Figure 2.12   Left: Empathetic Heartbeat, ©*Hideyuki Ando, Junji Watanabe, Masahiko Sato*, Right: Dream Sheep, ©*Sweet Dreamers*

stimulation, such as eye movements with repetitive physical stimuli; tapping with hands or pulsing a light bar, to activate the brain's information processing system, allowing for the reprocessing of memories. According to the study of Roger M. Solomon "EMDR Treatment of Grief and Mourning", he noted that EMDR therapy seems to encourage the emergence of positive and emotional memories of the deceased loved ones that support an adaptive inner representation (Solomon 2018).

2.4. Summary

I have explored the definition of continuing bonds and examined past and contemporary theories of bereavement so far, and I have looked into the direction my research should take. To summarise, grief is a natural aspect of life resulting from inevitable losses. Past bereavement theories such as those of Freud encouraged the bereaved try to detach from the deceased while more recent theories, such as those contributed by Kübler-Ross(1969) or Rando(1983) put forward stage or phase models to promote coping mechanisms after a loss. Contemporary bereavement theories, however, highlight the complex and diverse nature of grief, considering and take into consideration individual, interpersonal, and social elements that influence the process of mourning, adaptation, and meaning-making after a loved one's death. These theories acknowledge cultural, social, and environmental influences on grief experiences. They focus on how cultural norms

and social expectations shape responses to loss rather than presenting systematic methods for resolving grief.

Having reviewed these theories, I have conducted my own research by focusing on *continuing bonds* within contemporary bereavement theories. Continuing bonds represent a natural phenomenon where individuals maintain a connection with the deceased loved ones. However, the bereaved individuals sometimes avoid reminiscing about the deceased because it often triggers feelings of grief. As a designer and researcher, I have sought to explore how to maintain continuing bonds in a positive way. To address this, I have examined relevant works such as *StoryShell* (Moncur et al. 2015) and *ReFind* (Wallace et al. 2020) which are associated with my topic.

The way of continuing bonds is normally via thinking of the deceased, hence the focus on delving into literature concerning memory, senses, and emotions. My aim was not only to foster continuing bonds but also to provide comfort. During this exploration, I encountered the metaphor of the heartbeat. One of Stepanova et al's papers referred to the fact that different individuals possess varying comfortable breathing rates, for example, while a slow breathing rate of 6 breaths per minute may induce relaxation in some, it might trigger anxiety in others (Stepanova et al. 2022). Memories and grief are personal and varied, therefore, they led me to pursue the path of personalised design. Additionally, due to the sensitive topic, I had to consider ethical aspects. As there are no clinical data regarding the use of technology focusing on grief in bereavement, many medical professionals have concerns regarding potential side effects. The example of Stepanova et al. mentioned above demonstrates the necessity of these ethical considerations because it highlighted that even with the same heart rate, some participants may feel comfortable while others may experience discomfort.

Lastly, I initially researched the culture of mourning in the United Kingdom which had traditions, customs and rituals of grieving, some of which have persisted since the Victorian era. Subsequently, I investigated the culture of mourning in Japan and South Korea, as well as contemporary perceptions of death and mourning in modern societies. The culture of mourning is diverse, and there is a limit to how much can be reviewed in my PhD thesis. For this reason, this research has focused on the particular mourning culture of South Korea and Japan, considering

that most research on mourning rituals focuses on experiences in Europe. Thus, I selected participants from South Korea and Japan, and analysed then interpreted the perceptions and attitudes of Japanese and Korean participants towards my design. The main purposes were to find out how cultural rituals manage continuing bonds with the deceased, and secondly how bonds with the deceased are informed by their own cultures during the long-term research phase.

Notes

1   Charlotte Edmond, "Japan's aging population: The implications for its economy", World Economic Forum(2023)`https://www.weforum.org/agenda/2023/09/elderly-oldest-population-world-japan/`

2   Hiroko Nakata, "Part of aging process: Preparing for the end" The Japan times(2012) `https://www.japantimes.co.jp/news/2012/09/04/reference/part-of-aging-process-preparing-for-the-end/`

3   Ending Industry Exhibition 2023 `https://tenjikaieigyo.com/ending2023/`

4   Ending Industry Exhibition 2023`https://tenjikaieigyo.com/ending2023/`

5   Encyclopedia of Korean Culture`https://encykorea.aks.ac.kr/Article/E0027059`

6   Korea Institute of Funeral Culture Institute`http://www.mmi21.co.kr`

7   ReFind from the Enabling Ongoingness: Content Creation Consumption in the New Digital Age project. This research was funded by the UK research body EPSRC EP/P025609/1

8   "Fukkatsu no hi(Day of Reunion)". Whatever. April.2019. `https://whatever.co/work/nhk-fukkatsu-no-hi-day-of-reunion/`

9   "Peter 2.0: Living as a Cyborg". NHK World. December. 2021. `https://www3.nhk.or.jp/nhkworld/en/tv/closeup/20211203/4002844/`

10   https://campaignbriefasia.com/2013/05/22/jwt-singapore-and-givaudan-cre/

11   https://www.media.mit.edu/projects/teleabsence-1/overview/

12   https://www.amazon.co.uk/Sweet-Dreamers-Ewan-Dream-Sheep/dp/B011CCMOTE

Chapter 3
Design

3.1. Overview

This chapter presents the concept of "*Be.side*" and the whole process of designing *Be.side*. I introduce established well-known theories of grief and bereavement, at the same time, controversial points of view, and also past versus present cultural perspectives of continuing bonds from Chapter 2. In the literature review, it is understood that a continuing bond with the deceased is a natural human phenomenon, however many experts in the past, as well as the bereaved themselves, tended to avoid continuing bonds and to associate grief in a negative sense with the bonds. Many contemporary bereavement theories suggest that continuing bonds can relieve feelings of loss and grief of the deceased, however there are diverse situations of bereavement, and grief is a not linear process: complicated emotions are often mixed within it. Moreover, I discovered that the 'pre-death relationship' between the deceased and the bereaved may influence the continuing bonds after the deceased's passing.

In addition, it is noted that in the case of South Korea, there is a lack of practices involving continuing bonds with the deceased through physical objects. Because of traditional perspectives and Shamanism, South Korean bereaved people typically burn the deceased's belongings, and keeping these belongings is not seen positively. Japan has a traditional culture of keeping a Buddhist altar at home for continuing bonds with the deceased and mourning them, yet there are challenges regarding keeping rituals in contemporary homes and different religions. After reviewing the literature, I realised that more understanding of diverse bereavement, and defining research targets more precisely, were necessary before starting design. Thus, this chapter includes analysing diverse situations of bereavement

by in-depth interviews, workshops, field research, documentaries and so forth for understanding the bereaved people's emotion, and defines the target of design.

While gaining insights and defining the target through the literature review, a direction was emerging that some sort of artefact would be the most efficient "channel" for long-term uses and evoking memories of the deceased. Considering the bereaveds' long-term uses for maintaining continuing bonds and their sensitive emotions, extreme grief experience such as mediated via VR or a 3D avatar was not to be applied: instead, I focused on how to trigger the deceased memory of the bereaved. Therefore, to maintain continuing bonds, I proposed an immersive atmosphere using the multi-sensory as an indirect way if evoking the bereaveds' memories of deceased loved ones. The memory of the deceased in our minds, though it may be intangible and invisible, is the closest images of the deceased, much more so than artificial images. After several experiments and short-term experience, *Be.side* was created for maintaining continuing bonds in the context of design. I will describe the observations and analysis of how the bereaved reflected on this artefact in their lives, as well as how continuing bonds with the deceased affected their changes in attitude and thoughts in Chapter 4. This chapter starts from Methodology.

3.2. Methodology

3.2.1 Overview

This chapter presents the Methodology that helped shape the approach and viewpoint for this practice-based PhD. My research was exploratory in nature and required multiple rounds of refinement. In addition, deep collaborative effort with participants was required to ensure that the artefact I created could contribute to the bereaved individuals in their personal experience of bereavement. For these reasons, this research chiefly adopts Ethnographic Research as one of the exploratory approaches; a Research through Design(RtD) approach (Zimmerman et al. 2007, Zimmerman and Forlizzi 2014, Gaver 2012) was further adopted. The Participatory Design(PD) approach is a key method where the artefact *Be.side* is tailored to each participant (Foth and Axup 2006). What is important is that

Be.side could be continuously adjusted to suit the individual needs of each participant during the long-term study.
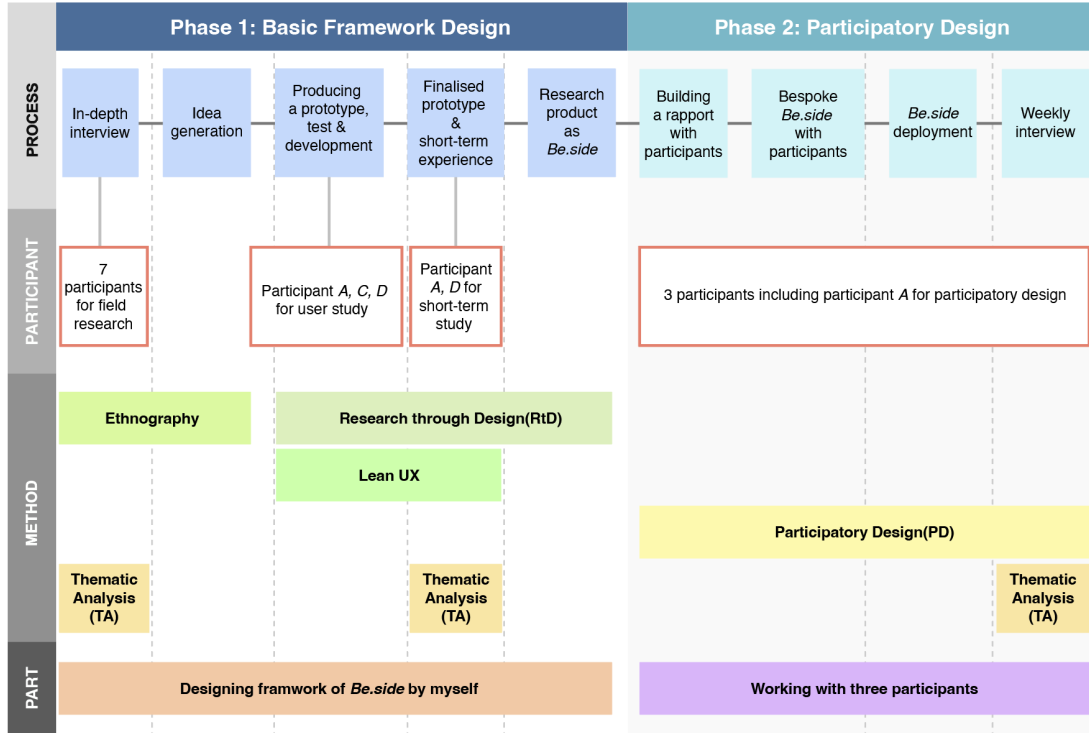
Figure 3.1 Overview of Research Process

In this research, I organised my design into two primary phases: 1. Basic Framework of Design; 2. Participatory Design followed by a long-term study situated in real-life conditions. A total of nine participants -three South-Koreans, four Japanese- actively participated. Most of research in bereavement has focused on Europe, but I wanted to explore these two countries' rituals of death and mourning, therefore, my research focuses on Japan and South Korea as mentioned in the Summary of the Literature review. Initially, seven participants took part in two initial rounds of in-depth interviews. These participants were recruited through my personal contacts from word to mouth and referrals from their families and acquaintances. Among these, three participants, along with one of their family members, actively contributed to the iterative development of the prototype. Fi-

nally, I recruited three additional participants in bereavement communities and Japanese-Korean communities by flyers. One of the latter had also taken part in all phases from interview, experiment and short-term experience. The overall research process followed the steps illustrated in Figure 3.1 on the previous page.

After interviews and contextual research including watching documentaries, participation in workshops and events, as well as a review of literature on bereavement, I reviewed my field notes and data to narrow down insights and develop an initial concept. Firstly, bereaved participants had a strong desire to preserve the memories of the deceased and to maintain continuing bonds through objects. However, they were reluctant to potentially inappropriate, counterproductive and uncomfortable experiences such as those involving the uncanny valley (Mori et al. 2012) or virtual reality (VR) (Pizzoli et al. 2021)(Stein 2021). Secondly, I drew on Massimi et al's study (Massimi and Baecker 2011) which noted how creating a personal and meaningful artefact could support a new relationship between the deceased and the bereaved (Massimi and Baecker 2011).

Therefore, I proposed an artefact as a channel of meeting the deceased because physical objects are often used as catalysts to trigger remembrance, helping individuals manage grief and honour their relationship with the deceased person. This artefact aimed to be fully personalised to help foster a sense of connection with a deceased person in a subtle and delicate manner. Through a series of iterative testing and development sessions with participants, I gradually incorporated multi-sensory elements that would be meaningful to each participant (Czech et al. 2020). To finalise the prototype, I conducted a 2-week short-term experience with two participants - one Korean and one Japanese - to gather feedback on prolonged use as well as to observe cultural difference. Then, the final prototype was further developed again as a 'research product' called "*Be.side*". A research product is distinct from a commercial product; it is designed to be non-functional as a product without the intention of selling, allowing users to focus on their experience (Odom et al. 2016). When considering participants' need to maintain a sense of connection with the deceased, a research product is an appropriate tool for this sensitive topic and validation through a long-term study. In addition, a recommendation was borne in mind of using *Be.side* four times a week for 5 to 15 minutes per session, as based on a psychiatrist's advice and with considerations

for participants' daily routines.

Lastly, I proceeded with a long-term study to understand how participants who had lost their loved ones maintained continuing bonds with the deceased through the *Be.side* and how this artefact affected their experience, emotions and lives. A long-term study was conducted for a total of eight months including several meetings from February 2023 for rapport building. The 4-week period was a mandatory period to use the artefact. After four weeks, participants used the artefact for continuing bonds whenever and however they wished until the end of September 2023. Therefore, participants were not required to return the artefact upon completion of the four-week long-term study. In terms of the decision made about the long-term study period, prior studies had indicated that a 4-week time frame was intensive and sufficient for evaluating artefacts and interventions within the realm of continuing bonds (She et al. 2021), and further, I considered the day dedicated to honoring ancestors, observed in August in Japan, where it is known as "Obon day", and in September in South Korea, where it is known as "Chu-seok".

Ahead of the four-week long-term study, several meetings were conducted with each of the three participants. These interactions were aimed at building rapport and deeply understanding their personal narratives and requirements through semi-structured interviews and primarily, questionnaires. I adopted a participatory design approach, involving each of the three participants one at a time, to collaboratively work with me on specific elements which were sound, scent, and speed of heartbeat. By drawing upon their memories of the deceased, each participant and I discussed and decided on representative sounds and scents of the deceased through their memories of the deceased. Subsequently, I replicated scent and sound of the deceased, and we adjusted them together, as we did the speed of the heartbeat and the lighting in order to create a fully personalised version of *Be.side* for each participant. In terms of replicating the scent, I took perfumery classes during my Master's project, "My Legacy"(See Chapter 1. Introduction), thus I had a basic knowledge of perfumery, and I also consulted with perfumers in south Korea. Additionally, I had various raw materials that I had created and purchased during the perfumery class in 2017 which I used. In terms of reproducing the sound, I utilised free sources and recorded sounds myself for use. In terms of reproducing the heartbeat stimulation, while I used a stethoscope to di-

rectly record my heartbeat sounds in the initial prototype, I used a free source of heartbeat sound at the end because it was clearer than any actual heartbeat sound.

Lastly, participants joined in weekly semi-structured interviews. Each interview was conducted for around 40 minutes to an hour. Over this 4-week duration, I observed how they interacted with *Be.side*; how they created and maintained continuing bonds with their deceased loved ones using *Be.side*, and additionally, I/we explored their experiences and ensured their satisfaction to continue the study. During the four-week long-term study, *Be.side* was continuously adjusted based on the insights and suggestions provided by the participants.

Every interview was audio recorded, and I also took notes as appropriate. Audio recordings were manually transcribed in Korean first and then manually translated into English. Using the mother-tongue was chosen to support participants in articulating their experiences in a manner that felt most comfortable and appropriate to them (Elhami and Khoshnevisan 2022). After transcription, I repeatedly read each participant's contents until they were fully familiar to me. Then, I followed a 'Thematic Analysis method' adopting both inductive and reflective approaches (Braun and Clarke 2006). The specific methods will be provided in detail in the following sections.

3.2.2 Research through Design

In my PhD research, my focus was not solely on a physical 'product' design as a result. My whole process of design including field research, experiments with participants, interviews with them, building rapport and participatory design is a form of research, generating knowledge and understanding the realm of design as well as bereavement theory.

Christopher Frayling, a prominent figure in design theory and education, asserted that "Research in the arts and design can be conducted through the very act of creating artefacts" and acknowledged that "The artistic and design process is a form of inquiry that can contribute to knowledge and offer novel perspectives" in his book "Research in Art and Design" (Frayling 1994). Frayling coined three approaches in his book: "Research through (Art and) Design", "Research into (Art and) Design" and "Research for (Art and) Design". In detail, "Research

through Design" emphasises how things and created, thus it focuses on the process of developing artefacts. The goal of "Research into Design" is to explore historical views, aesthetics or theoretical views on design from different sources. "Research for Design" is gathering research knowledge that contributes to making a physical object or artefact. It focuses on visual or image-based communication rather than just written knowledge. In this regard, my PhD research attempts to regard Christopher Frayling's model of research, termed "Research through Design (RtD)" as a primary research approach in design practices, and, in particular, I adopted a Research through Design (RtD) approach for prototyping development. My initial hypothesis was that inducing comfort and meditation through the heartbeat sound (as based on the literature review) would contribute positively to the bereaved. Due to the specific target of the as 'bereaved' participants, the heartbeat alone triggered the sad memories of last moments at the hospital. Through these trial and error phases, the combination of heartbeat stimuli, smell and sound with gentle lighting culminated in the outcome entitled *Be.side*.

3.2.3 Ethnography

Ethnographic research (Brewer 2000, Ouroussoff 2001) is a qualitative research method, widely used in anthropology, sociology, psychology and other disciplines to gain insights into a variety of social and cultural contexts. In addition, it is used to understand and describe culture, behaviour, social interactions of a particular group of people or community as well as to provide insights from their points of view and actions in given environments or incidental happenings in their lives. It includes immersive fieldwork, often conducted through participant observation, focus group interviews, individual in-depth interviews, diary studies as well as analysis of artefacts and documents. In particular, ethnographic research seems highly appropriate for my topic of research. Referring to the book 'Continuing Bonds: New Understandings of Grief (1996) (Klass et al. 2014)', the authors noted a remarkable methodological consistency in the contributors' chapters. They found that those emphasising a lasting connection with the deceased primarily employed qualitative research methods rather than quantitative ones. For this reason also, I adopted an ethnographic approach for my PhD research.

Key elements I used in my research included:

1) Interviews and Conversations: I conducted two rounds of interviews with seven participants in the initial part of the design process. During the long-term study, three participants had several interviews and conversation with me to build rapport and to share their experience of when they lived with *Be.side*. These interviews were semi-structured. During the interview, I was able to gather personal experiences, emotions and perspectives of individuals grief and thought of the deceased.

2) Field Notes and Documentation: The detailed field notes and documentation of observations, conversations, and experiences are crucial in ethnography. These records helped me to analyse and interpret the collected data of the PhD research.

3) Artefact Analysis: The artefact *Be.side* has three elements; scent, sound and heartbeat stimulation based on translucent lighting for an immersive atmosphere. I analysed related objects, as well as bereavement theory and cultural aspects to understand values, culture and practices, then create *Be.side*.

4) Long-Term Engagement: Regarding the validation of my design, I worked deeply with three participants. The topic of my research is very personal and sensitive, thus long-term engagement allowed me to build rapport, gain trust and understand participants' changing emotions over an extended period.

3.2.4 Lean UX

Lean UX (User Experience) is a kind of user experience design and product development that focus on delivering value to users with minimal waste. Lean UX has three main processes: Think - Make - Check (Figure 3.2), and this method is often used iteratively in development environments. I used Lean UX method for prototype development via participants' experiments.

The Key aspects of Lean UX for my design included:

1) User-Centred Design: After creating an initial prototype, I conducted three iterative tests to understand user needs and validate assumptions through continuous user feedback. I interacted directly with users to gather insights, then into the prototype were gradually integrated new proposed elements such as sounds and scents. In addition, considering users' perspective and the personal and sensitive topic, I continually refined the prototype until the start of the long-term study, and focused on user-centred design.

2) Collaboration: Lean UX fosters teamwork among diverse groups including designers, developers and various stakeholders. In my case, I collaborated with an engineer for prototype development and consulted a psychiatrist and a psychologist.

3) Iterative Design: Lean UX encourages iterative cycles of design, prototyping, and testing. Instead of creating detailed documentation, I created an initial lightweight prototype which only applied heartbeat stimulation and lighting. Then, in an iterative process based on the "check, think, and make" method, I incorporated participants' feedback after completing their experiments, and finalised it all in the form of a research product.

4) Hypothesis-Driven Design: Designers use the Lean UX method for hypotheses and assumptions about what would work best for the users. The hypotheses were tested and validated through user testing and feedback. Through literature reviews, my hypothesis was that participants who had lost a loved one would experience comfort and meditation through the heartbeat stimuli. However, in the first experiment with the initial prototype, which was only applied heartbeat stimuli, a participant recalled negative memories associated with a hospital. Applying this feedback, I added scent and sound elements to enhance the positive role of heartbeat stimuli.

3.2.5 Participatory Design

The name of Participatory Design(PD)(Gregory 2003) has been defined as "collective acts of creativity" for almost four decades (Sanders and Stappers 2008), and it is a well-known design approach in the design industry, widely used in a variety of disciplines beyond the design industry to software engineering, architecture, contemporary arts. It originates from Scandinavian software development traditions in the 1970s; the bulk of such participatory design activities has primarily taken place in Europe. It was initially created for increasing the productivity of workers and engaging them in the creation of new systems and reasonable expectations of their workplace (Sanders and Stappers 2008)(Gregory 2003). The term participatory design was employed until the recent fascination with what is currently referred to as co-creation or co-design (Holmlid 2009).

Co-creation, co-design, and participatory design encompass collective creativity involving 'two or more individuals'. While co-creation is a comprehensive term spanning physical, metaphysical, material, and spiritual realms, co-design is a specific form of collective creativity. Some individuals consider co-design as the collaborative creative effort of designers working together(Holmlid 2009). The chief feature is that participatory design describes involving users as "partners" not as "subjects", as led by Northern European (Holmlid 2009)(Panke 2016). This means that users actively participate in design processes through their experience and perspectives(Gregory 2003).

Participatory design is a broader concept emphasising collaborative design processes with "end-users" end-users give insights and are given space for ideation, prototyping or conceptualising in the design process, often requested by the users themselves(Panke 2016)(Foth and Axup 2006). Therefore, participatory design is in contrast to "customisation" which specifically addresses tailoring products to individual user needs (Panke 2016). It is also different from "User-Centred Design(UCD)". UCD is an established method of design which is primarily US-driven, where designers or researchers adopt an 'expert perspective' and adopt a more passive approach to understanding users' experience and behaviour through simple observation and analysis of experiments (Sanders and Stappers 2008)(Foth and Axup 2006)(Holmlid 2009).

In topics related to bereavement or mourning, the circumstances of bereavement

vary, and emotional stages differ. Therefore, in terms of existing design practice-based research, it is usual to work extensively with one bereaved individual, or focus on a smaller group of individuals using participatory approaches (Wallace et al. 2020)(Moncur et al. 2015)(Uriu and Odom 2016)(Klass 2006). In this regard, I adapted a participatory design approach because, given that memories vary among individuals and the memories of the deceased are diverse, this is an essential approach that facilitated this research.

Here are key characteristics of my research using participatory design:

1) Collaboration: I designed the framework and components of *Be.side* myself in "Phase 1: Basic Framework Design". However, in "Phase 2: Participatory Design", I understood the requirements of three end-users, bereaved participants, during the rapport building. After several meetings with the participants, each individual participant and I authentically collaborated together, key activities that culminated in three individual bespoke *Be.side* artefacts, made possible by the participatory design approach.

2) Empowerment & the Iterative: Participatory design aims to empower end-users by ensuring that it meets their needs and preferences. Thus, the process is often iterative, allowing for continuous feedback and refinement. Therefore, I allowed participants to request continuous feedback and make additional requests if needed during the long-term study. Participant *Yui* requested attaching a photo of her late father in the *Be.side*, while participant *Min* requested another scent and sound based on one of his childhood memories. Of note is, the requirement of attaching *Yui*'s photo of her late father - an unanticipated request. I refined her *Be.side* by presenting her late father's photo as a subtly flickering illumination synchronised with the heartbeat stimuli. Such an approach resulted in a completely personalised artefact that symbolised their deceased loved ones via participatory design.

3.2.6 Thematic Analysis

Thematic Analysis is another qualitative research method, and is a flexible approach that allows researchers to identify or analyse meaningful themes or patterns

of meaning from their data (Lochmiller 2021). I used Inductive Thematic Analysis(ITA) and Reflexive Thematic Analysis(RTA)(Braun and Clarke 2019, Braun and Clarke 2021) with an iterative process for analysing data of the long-term study. Both Inductive Thematic Analysis(ITA) and Reflexive Thematic Analysis(RTA) are approaches necessitating qualitative data analysis that aims to identify themes or patterns within the data. However, there are some differences between the two:

1) Philosophical Underpinning

- ITA: It emphasises the importance of setting aside preconceived notions to derive themes directly from the data.
- RTA: This may consider the researcher's role and potential preconceived notions through their background and experiences, and encourage reflection on the impact of their perspectives on the analysis.

2) Integration of the Researcher's Perspective

- ITA: The emphasis is on maintaining a more objective stance and letting themes emerge naturally from the data.
- RTA: There may be a more explicit acknowledgment of the researcher's subjective role, and the analysis may involve an exploration of how the researcher's perspectives shape the interpretation.

3) Use of Theory

- ITA: It may start without a specific theoretical framework, allowing themes to emerge without predetermined categories.
- RTA: It might involve a more active engagement with theory, considering how theoretical perspectives inform the interpretation of themes.

These distinctions are not rigid, and researchers may incorporate elements of both approaches depending on their research questions and goals. It was neces-

sary for me to approach this long-term study with an open mind in order to make new discoveries. However, I also had hypotheses about the use of heartbeat stimulation and various multi-sensory stimuli for reminiscence. Additionally, being a South Korean, I already knew about the mourning culture in Korea, as well as the difference of mourning culture in Japan. Therefore, I had an expectation of potential differences based on participants' nationalities. Moreover, I had prior knowledge of the bereavement theory, therefore I could consider how this theoretical perspective might influence the interpretation of the data. Therefore, in the results of the long-term study, I utilised ITA when creating codes with an objective stance, while I utilised RTA for creating categories and themes. Moreover, RTA was utilised for interpreting interviews, finding insights and analysing the phase of the basic framework design process.

Key processes of analysis include:

1) Data Preparation: After finishing the initial interview and the 4-week interview from the long-term study, I transferred all interview data from voice recording, video recording or note taking to the script. Then, I read the written script repeatedly until the contents were fully familiar.

2)Creating Codes: During the reading process, important words or phrases called "code" began to emerge within the whole context of data. I used "In Vivo" coding (Castleberry and Nolen 2018). In vivo coding is a qualitative research technique used in various fields, including social sciences and ethnography. The researcher codes the data by "directly using the language and terminology" employed by the participants, capturing their perspectives and meanings. This approach aims to maintain the context and authenticity of the participants' experiences and viewpoints in the coding process, making it useful for gaining a deeper understanding of the data.

3)Binding as Category: I collected the codes and started to bind the codes together, recognising patterns or connections among them and categorising them. These categories formed the basis for identifying broader themes or overarching concepts in the data.

4)Creating Themes: After key categories had been identified, I created themes and reviewed these with my supervisors to check whether the themes I had found were appropriate.

5)Refinement and finalising: I adjusted or refined to ensure the themes were well-defined and distinct through an iterative process of revisiting and modifying themes. Finally, I interpreted each theme and extracted meaningful insights, topics and conclusions.

3.3. Ethnographic Research

3.3.1 Survey of Attitudes toward Bereavement

First of all, I created a Google form to investigate attitude towards bereavement, and distributed it around my SNS from Feb to Jun 2020. A total of 51 individuals participated, ranging in age from their 20s to their 80s, and representing diverse nationalities including those from South Korea, Japan, Greece, the United States, the United Kingdom, China, Germany, Vietnam, Thailand, Mexico, and Indonesia. Respondents also had diverse occupations, including students, designers, accountants, engineers, homemakers, professors, artists, architects, doctors, lawyers, nurses, and soldiers, among others. However, regardless of nationality or occupation, the grief experienced from losing a loved one and the process of overcoming it appeared to be similar.

The results showed that 92% of the respondents had experienced the loss of a family member, close friend, or pet. Respondents stated that the most challenging aspect when a loved one passes away is the process of grief. That is to say, they found the emotional emptiness and the inability to see their departed loved one again to be the most difficult aspects. Additionally, they mentioned that managing social media accounts related to the deceased, organising the deceased's belongings, and handling funeral arrangements and financial matters were also challenging tasks during that time.

When the question of "How they managed to overcome the period of grief", most

respondents mentioned that they simply waited for time to pass. Some intentionally kept themselves busy, trying to live in the present and making an effort to forget about the deceased. Others sought counselling to help them cope with their grief. Respondents who had religious beliefs mentioned that they prayed, while others mentioned visiting the grave to mourn the deceased or making an effort to maintain a positive mindset during the grieving process.

91% of the respondents occasionally reminisced about their deceased loved ones, they mentioned a variety of triggers and moments when this occurs. These triggers included 'memories of shared experiences', 'encountering things that were favourites of the deceased', 'seeing or hearing something related to the deceased', 'recognising that they are using the same phrases as the deceased used to use', 'noticing physical resemblances to the deceased', 'looking at photos from when the deceased was alive or listening to recordings of their voice', 'special occasions such as birthdays or wedding anniversaries'. Some respondents also mentioned 'when they need advice from the deceased' or 'simply it comes to mind from time to time', and 'while lying down and smelling the duvet'. When the question of "if you are maintaining continuing bonds, how they maintain it?", respondents answered that they visited the temple, church, cemetery or grave to pray for the deceased, and some never deleted the deceased's recorded voice. They also believed that the deceased are looking out for them, regardless of their religious beliefs and nationalities, some kept saying something to the deceased in their minds or some were living their lives in honour of the deceased.

3.3.2 In-depth Interview

1st In-depth Interview

After the survey, to gain a deeper understanding of individual bereavement experiences as well as remembrance and mourning practices, I began research by carrying out two rounds of in-depth interviews with seven participants (see Table 3.1 on next page). The first interview round was conducted from 27 July 2022 to 3 August 2022; the second interview round was conducted on 30 December 2022 and 12 January 2023 respectively.

The interviews took place via Zoom and in participants' homes. I restricted

recruitment to individuals identifying as South Korean or Japanese to focus on exploring the death and mourning rituals of South Korea and Japan, two countries in East Asia. In addition, three of the South Korean participants and four of the Japanese participants confirmed that they did not hold strong religious beliefs or have a history of mental health conditions following the loss of their loved ones, either of which could affect the mourning process. I conducted interviews in two rounds to foster stronger and more consistent relationships while reducing the emotional load of each interaction (Read 2018), also I felt the need for target segmentation during the research. Interviews were audio recorded and transcribed by myself, then I analysed and found insights.

Table 3.1 In-depth interview Participants' Information (As of 2022)

Participant	Participant age	Relationship with the deceased	Reason for loss	The deceased's age at death	Time from bereavement
A	late 30s	Father	Chronic disease	50s	12 years
B	late 30s	Father	Heart attack	40s	21 years
C	early 60s	Mother	Chronic disease	80s	5 years
D	late 20s	Grandfather	Chronic disease	70s	7 years
E	early 60s	Father	Chronic disease	70s	20 years
F	early 40s	Grandmother	Heart attack	90s	2 year
G	late 20s	Grandfather	Accident	40s	40 years

In the first round of in-depth interview, my primary focus was on investigating the factors that influenced the emotions of individual participants who have experienced loss and grief. This encompassed understanding the situations and triggers of remembrance and reminiscing, as well as perceptions regarding analogue and digital mediated practices including symbolic objects and artificial visualisation.

The emotions and perspectives of seven bereaved participants varied greatly depending on the circumstances and length of time since the death of their loved ones. Participants who had lost their loved ones more than 10 years ago generally showed a more stable emotional state. Of note, South Korean participants mentioned that there were some moments when they missed the deceased, some were still grieving but they could not express their feelings in front of family members.

While the rituals are different, Japan and South Korea both celebrate the anniversary of someone's death. However, the mourning of the anniversary of the

loved one's death over time had become more a formal occasion, resulting in fewer opportunities for genuine emotional connection. For example, Japanese participant E calmly talked about her late father who had passed away 20 years earlier. Her house had a Buddhist alter for her late father where she prayed every day. Yet, she started to cry more and more during the interview. This interview triggered a specific memory of her late father that completely overtook her at that moment.

None of the participants had a positive perspective concerning the recreation of a deceased person through artificial visualisation, but all participants had positive opinions towards the use of symbolic objects. Young South Korean participants especially wanted to keep the deceased's possessions even though these are traditionally burnt after death in Korea. Further, young Japanese participants also wanted a new way of communication with the deceased rather than through a traditional Buddhist altar due to diverse religious beliefs.

2nd In-depth Interview

In the second interview, the questions were focused on the process of grief change. All participants answered that the most difficult period they experienced was immediately after the death of their loved ones. They strongly clung to objects of the deceased loved ones after they had just faced death with the loved ones, such as hugging the deceased's clothes and smelling their body scent and looking for photos or letters from the deceased. It seemed that they looked for objects that could replace the deceased, and these objects acted as catalysts for connection that helped the bereaved in their longing and sorrow.

The duration of strong grief varied from person to person. Some mentioned a period of six months to a year, while others experienced it for over three years. During this time, feelings of anger, depression, longing and guilt were repeated. However, after this difficult time, participants answered that they gradually tried not to recall the deceased, and avoided talking about the deceased because painful emotions might have come back up. By contrast, for instance, Japanese participant F who lost his grandmother two years ago, mentioned that he still listens to her favourite song, which was played at her funeral. As their emotions gradually dulled and their memories started to fade, participants accepted the loss. Never-

theless, they feared that their memories of the deceased would fade away.

3.3.3 Interview with experts

Medical Professionals

The purpose of these interviews was to gain insights into the real-life experiences of psychiatrists who regularly encountered patients directly affected by bereavement and nurses who cared for patients and their families during end-of-life treatments. Specifically, it aimed to understand how the sadness associated with bereavement was treated from a psychiatric perspective.

- Hwani Park, Nurse
Te Whatu Ora-Waitaha Canterbury, New Zealand
Expertise: Palliative care

Hwani Park worked as a nurse, primarily in nursing homes and general hospitals in Christ Church, New Zealand. At the time of the interview in December 2020, she was on leave due to pregnancy. The interview was conducted in Zoom.

Her primary patients were elderly people who were receiving life-sustaining treatments, normally for cancer. She stated that elderly people often faced health issues in various areas from kidney, liver to heart, then normally cancer at the end. Their treatment was a kind of comfort care as known as Palliative care which usually included injecting Morphine or Fentanyl just for relieving pain. During the interview, one striking aspect she mentioned was the significant number of patients who had no family members visiting them. According to her interview, she saw many cases in which approximately 20% of patients had experienced a bad relationship with their family, some patients even faced their final moments without any family by their side. This situation may have been because prolonged life-sustaining treatments could be emotionally draining for both the patients and their families. She mentioned that it was important to consider how a person passed away when it came to maintaining continuing bonds with the deceased. She observed that when patients who had undergone extended life-sustaining treat-

ments for over ten years passed away, their families often experienced a sense of relief that overshadowed the grief of separation.

- Su-guen Im, Psychiatrist
SG Psychiatric Clinic, South Korea
Expertise: Trauma & Depression

Su-guen Im is a psychiatrist who worked at a general hospital for a long time and then established his own practice in 2020. The interview was conducted on December 2020 by Zoom.

According to his interview comments, patients experiencing bereavement-related depression tended to visit hospitals most frequently immediately after the death of their loved ones, normally presenting with problems of insomnia and loss of appetite. In cases of bereavement, when patients tended to blame themselves or have differing perspectives on the loss, they often experienced reduced motivation, sleep disturbances, and loss of appetite. When dealing with feelings of guilt, self-blame, or immersion in the grief of the deceased, Su-guen noted that he used methods focused on "venting the emotions of sorrow". If patients found it difficult to express their emotions or talk about their grief, he collaborated with music therapists or art therapists. He also pointed out that in cases where patients were suffering from complicated grief, for example, those who had lost their families in unexpected accidents, they might experience the feeling of self-deprecation. In this case, treatment needed to focus on this area. He noted that Eye Movement Desensitization and Reprocessing(EMDR) therapy was used in conjunction with a focus on trauma to address these issues.

- Yoshida Atsushi, Psychiatrist
Keio University Hospital, Japan
Expertise: Mindfulness & Self compassion

Yoshida Atsushi is a psychiatrist, working at a general hospital. The interview

was conducted on August 2022 by Zoom.

According to his interview comments, when a family member was lost, it was typical to experience feelings of depression and sadness. He mentioned that it was essential to understand that these emotions were a natural response to such a situation. When a patient questioned whether their sadness and pain signified a psychiatric illness, he responded with empathy, reassuring them that these emotions were common. The crucial thing was to allow them to feel these emotions rather than suppress them. He said that listening attentively to their feelings was important, and it was not with the goal of making them feel better but to provide empathetic companionship.

Sometimes, discussing the deceased with bereaved patients could be challenging. In such cases, he mentioned that using the support of counselors or self-help groups was a valuable option. Engaging with professional therapists or participating in self-help groups allowed individuals to explore their relationships with the deceased, share anecdotes or discuss near-death experiences eventually helping them to reshape their narratives. Maintaining an open mind and creating a receptive atmosphere was vital when he listened, and he noted that he never rushed through this process. The approach of offering slow and careful care normally worked towards healing for many patients. However, for a few individuals who remained depressed even after extensive discussions, he mentioned that more complex therapy methods may be needed such as interpersonal psychotherapy, Cognitive-Behavioural Therapy(CBT), EMDR or compassion-focused therapy among others.

Producer of the Documentary "Meeting You(2020)"

I and other researchers had the opportunity to interview Jong-woo Kim, the producer of "Meeting You", on 16 October 2022. As I described above, the documentary of "Meeting you" comprised a mother who met her late daughter, Na-yeon, as a 3D avatar in a Virtual Reality environment. After the documentary aired, he had already perceived various ethical issues such as questioning the ownership of the words spoken by Na-yeon and so on. He told us that he conceptualized this documentary as an event with the intention of providing a "platform" for

Na-yeon's mother to express her grief. He mentioned that for effective communication with the audience through mass media, a script was necessary and some intentional and artificial elements became inevitable.

Nevertheless, he made an effort to faithfully recreate the experience, incorporating details such as the words frequently used by Na-yeon and the toy she always had with her. As a result, despite the mother's awareness that the virtual reality was artificial, Na-yeon's face lacked perfection and the voice was from an AI, the mother became fully immersed in the atmosphere, and cried a lot. According to Jong-woo's thought, the reason for her deep immersion was because Na-yeon's avatar was constructed from the mother's own memories of her daughter. He mentioned that he had observed Na-yeon's family for a long time and had carried out multiple in-depth interviews. He reported that the mother might have noticed personal nuances that the general audience couldn't discern.

3.3.4 Comparative Analysis

CHI Workshop 2020: HCI at End of Life & Beyond

The purpose of this workshop was to address the need for a more comprehensive and meaningful exploration of the topic of death within the field of Human-Computer Interaction (HCI). While some attention has been given to this topic in HCI, there is a need to expand and embrace a wider range of contexts related to the end of life.

Due to the constraints of the COVID-19 pandemic, the workshop was conducted online from 25 to 27 May 2020 with participants divided into groups based on their respective time zones: Europe, the United States and Canada, and Japan and Australia (Figure 3.3). I had the opportunity to share and discuss research topics with researchers from Japan and Australia, as well as engage in discussions on themes presented by the organizers. The workshop aimed not only to bring experts together but also to create an inclusive environment for those for whom HCI at the end of life and beyond is a new area of interest.

Through this design-focused workshop, experts and interested individuals came together to creatively explore the opportunities and challenges for HCI at the end of life and beyond. The discussions and design activities were supported by

conceptual resources for design, personal accounts of lived experiences, design methods, and ethical considerations.
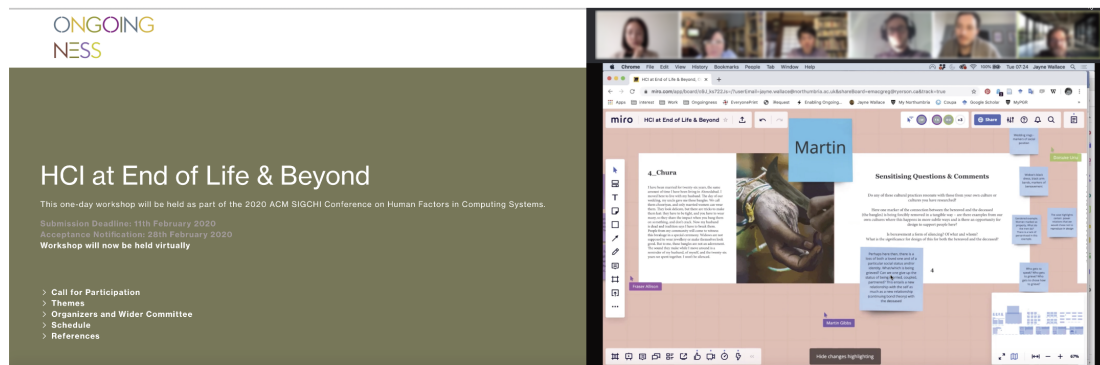
Figure 3.2 Participation of CHI Workshop in 2020

Death Cafe in South Korea and Japan

"Death Cafe[1]" is a non-profit initiative that doesn't have a fixed physical location; it is typically held at temporary venues, someone's house or as part of affiliated events within death festivals. The primary aim of Death Cafe is to encourage people to make the most of their finite lives, recognizing that contemplating death can help bring clarity to our lives. While anyone interested in the subject of death can join, most participants came with personal experiences of death with their families or loved ones. They gathered to discuss various aspects of death while enjoying tea, coffee and cakes, then they shared their grief and empathised with one another.

This concept originated with Dr.Bernard Crettaz, a Swiss sociologist and anthropologist, who organised the first cafe in 2004 (Nyatanga 2017). Jon Underwood, a British web developer, was inspired by Crettaz's initiative. He subsequently launched the Death Cafe website in 2011, and facilitated its global spread. The year of 2022 marked the 11th anniversary of Death Cafe, with a remarkable presence of 15,029 Death Cafes across 82 countries as of 2022.

- Death Cafe in South Korea

I participated in a Death Cafe event in South Korea on 20 November 2022 (Figure 3.4). The participants came from various professional backgrounds, including a funeral instructor, a pilot, a brain scientist, a welfare worker and more. Their personal stories and stages of grief varied widely.

While many participants at the Death Cafe had experienced "ordinary" bereavement, some had experienced the unexpected loss of family members or early deaths. For instance, one participant had been carrying the guilt of her younger sister's suicide 12 years ago. Another participant had recently experienced the pain of losing her son in a car accident just a year ago. There was also the story of a participant who faced her youngest sister's death at the age of 24 years due to stomach cancer which ultimately had inspired her sister to become a welfare worker. Their grief still carried elements of guilt that set it apart from the grief associated with more "typical" bereavement experiences. The participant who appeared to be around 60 years old shared, "A few years ago, my mother passed away. If the emotion I feel towards my mother is 'longing,' then the emotion I feel towards my younger sister who took her own life is 'guilt for not protecting her."

I gave a special lecture, entitled "Mourning as a designer's perspective" and shared my project concept. The other participant who had a younger sister that passed away when she was 24 years old mentioned, "Because my younger sister died at a young age, talking about her was a taboo subject in my family and we incinerated all of her belongings. Consequently, we had no means to alleviate my longing. It seems that your concept could serve as a means of solace."

- Grief Setagaya in Japan

In early February 2023, I had a Zoom meeting with staff in Satagaya Grief. Their programme was segmented including children who have lost their parents and widows who had lost their husbands. The staff member, Ms. Makiko who had a background in psychology was interested in my project and empathised with it, stressing how it was valuable. In particular, she mentioned that some people who had recently experienced bereavement found it challenging to express their feelings when they visited clinics. She thought that this artefact could help them open up and share their stories. After the meeting, I asked if it would be

permissible to distribute flyers to find participants for the long-term study. They agreed, and I proceeded to hand out the flyers.

Documentaries

To understand and gather more context about the diverse situations of bereavement, I analysed documentaries of disaster (Viswambharan and Priya 2016) including the one focused on the Tohoku earthquake(2011) (Gill et al. 2015) in Japan, and the Sewol Ferry(2014) (Chae et al. 2018) in South Korea.

The documentary I first watched was "Tsunami, 10 Years in the Rebuilding of a Town from Zero, Rikuzentakata, Japan Earthquake", that aired on ANN in March 2021 marking the 10th anniversary of the Tohoku earthquake [2]. This documentary focused on the families who had lost their fathers or daughters or husbands and wives in the earthquake, and it portrayed the process of the community as a whole: how individuals continued their family businesses and overcame their pain, rebuilt and moved forward. The documentary showed that a son who had lost his father continued their family businesses although he still experienced regret, while a father who had lost his daughter was still searching for her remains. His grief was fixed on the day of the earthquake, and he mentioned that "It feels like my half of body is missing".

Another documentary I watched is a special documentary produced by Japan's NHK to commemorate the 5th anniversary of the Sewol ferry tragedy. It was broadcast on NHK BS1 on April 30, 2019 [3]. The documentary begins with the discovery of a video on the mobile phone of deceased high school students, shot from inside the ferry, and sheds light on the lives of the surviving students and bereaved family members who received it. In contrast to other documentaries that typically focus on uncovering the truth of the incident, this documentary places the spotlight on the remaining family members and surviving students, and shows how they confronted the intense pain of bereavement and how they have been coping with their grief and their lives.

A mother who had lost her daughter in the Sewol ferry accident chose to preserve her daughter's room, avoiding the cultural practice of burning of the deceased belongings. Similarly, the younger sister who had lost her brother in the same

tragic event, expressed her fear that her brother's scent would fade away from his room.

3.3.5 Analysing the Target

Grief is a complex emotional process that defies simplification into regular stages. As I introduced in the earlier literature review, Elizabeth Kübler's theory of the Five Stages of Grief primarily focuses on dying patients and illustrates grief as a linear process, raising concerns about its empirical applicability to the bereaved.

Through surveys, in-depth interviews with participants and experts, participation of CHI workshops and Death Cafe events, I engaged in conversations about bereavement with diverse individuals, and also analysed documentaries. My first conclusion was that grief could not be simplified as a regular linear process, but complicated emotions could be significantly overlapping. Furthermore, I discovered that the methods of mourning and remembering the deceased varied based on cultural differences, personalities and preferences etc, even some bereaved avoided to remembering the deceased. As a result, I re-defined the grief process as a graph and segmented the group of the bereaved (Figure 3.5), communicating them as"Ordinary Bereavement" and "Unexpected Bereavement", and from that, I defined the target for design.

Ordinary Bereavement

Ordinary Bereavement refers to the loss of a loved one due to the natural progression of aging and illness. The concept of aging is subjective and can vary depending on the perception of the bereaved; however, for the purpose of this study, Ordinary Bereavement is defined as the loss of older individuals, such as parents or grandparents, whose passing aligns with the expected course of life. The bereaved who experienced "Ordinary Bereavement" seemed to have begun to accept the reality as time passed, yet, sometimes felt regret and anger. Some of the bereaved noted that they experienced moments of sadness and even depression over quite a long time. Others noted that when they thought about their deceased loved ones, it could trigger feelings of loss and sadness. They didn't know how to deal with these moments when they missed the deceased. Therefore, as depicted

by the blue line in the above graph of Figure 3.3, the bereaved who experienced ordinary bereavement" indicated higher levels of complicated grief, particularly during the initial three years, however, the graph of the strength of grief declined as they gradually came to terms with their reality and moved forward in their lives. Nevertheless, there were occasionally up and down in the graph, representing moments when they missed their deceased loved ones, leading to a resurgence of feelings such as depression or anger.

Unexpected Bereavement

In contrast, those who experienced "Unexpected Bereavement", including accidents, suicide, or when someone passed away at a young age, often faced profound shock and grief. They tended to experience heightened feelings of guilt that they couldn't resolve over time. Unexpected Bereavement can further be categorised based on the 'public context' such as natural disasters or social (man-made) disasters, and 'individual circumstances' such as suicide. In particular, some bereaved who lost their loved ones due to social man-made disasters continued to grapple with complex grief. In such cases, they remained preoccupied with finding someone to blame and uncovering the reasons behind the tragedy. They obsessed on the event, therefore, as shown in the graph by the red line (Figure 3.3), the bereaved still suffered anger and depression, that didn't decline over time. However, in a public context, this group found comfort and support in the bonds and empathy they shared with other bereaved people.

3.3.6 Summary & Finalised Target

I firstly conducted two rounds of in-depth interviews with seven participants, and watched documentaries focusing on mourning and sudden loss from disaster in Japan and South Korea to understand diverse bereavement experiences (Viswambharan and Priya 2016). I also participated in several workshops at 'CHI 2020 conference' and 'Death Cafe' in South Korea and Japan, and conducted field research for better understanding of mourning cultures of Japan and South Korea. Additionally, I had an interview with medical professionals in South Korea and Japan to understand bereaved patients' treatment, and with a producer of the documentary

"Meeting you" in South Korea to broaden my understanding of technology and insights. Then, I gained the insight that bereaved participants had a strong desire to preserve the memories of the deceased and to maintain continuing bonds, but they didn't know what to do. Participants commonly took out photos of the deceased when they missed them. However, South Korean participants in particular didn't have the deceased possessions due to the traditional disposal practice, and they were reluctant to preserve the deceased possessions due to the influence of Shamanism. Younger generations in Japan and South Korea sought a new way of mourning which was different from traditional rituals. Bereaved people in Death cafe and documentaries who lost the deceased through unexpected accidents still struggled with grief and ongoing guilt. In addition, according to the psychiatrists' interviews, listening to bereaved patients' feelings and providing empathetic companionship was important.

To summarise, through the ethnographic research, I discovered the need for a "channel" that connected the bereaved and the deceased to help them to maintain continuing bonds. In addition, I realised that a new mourning channel, distinct from the traditional mourning practices in South Korea and Japan, was needed, particularly for participants in South Korea, where households with the deceased's belongings are rare, I felt the need for a channel that could be a symbol of the deceased. Additionally, I recognised the importance of listening to the stories of bereaved participants and providing a platform for them to express their emotions and find comfort.

I further realised that bereavement could not be simplified as a regular linear process, and that complicated emotions could be overlapping. Thus, I re-defined the grief process as a graph and segmented the group of the bereaved, communicating them "Ordinary Bereavement" and "Unexpected Bereavement", and I finally decided that my target would be "Ordinary Bereavement" . The reason why is that the Continuing Bond Theory as introduced in the literature review is also based on ordinary bereavement", highlighting the importance of maintaining a sense of connection. In addition, using technology to deal with grief currently lacks clinical data, and the intensity of grief varies depending on when and how the deceased passed away, as well as the depth of the relationship. Therefore, personal vulnerabilities need to be carefully assessed and managed. Hence, if I focused on

unexpected bereavement, there could have been potential risks, limitations, and accessibility barriers. Therefore, given the nature of my research which aims to contribute to maintaining continuing bonds in the context of design, it made sense to focus on ordinary bereavement. Of course, even concentrating on "Ordinary Bereavement", some bereaved want to leave the deceased behind, while other bereaved seek to maintain continuing bonds with the deceased (Woodthorpe 2011). The target of my design is the latter, "the bereaved who are faced with 'ordinary bereavement' and seek to maintain continuing bonds with the deceased". In the following section, I introduce the goals and concepts of the design targeted at "bereaved people who seek to maintain continuing bonds with the deceased in ordinary bereavement".
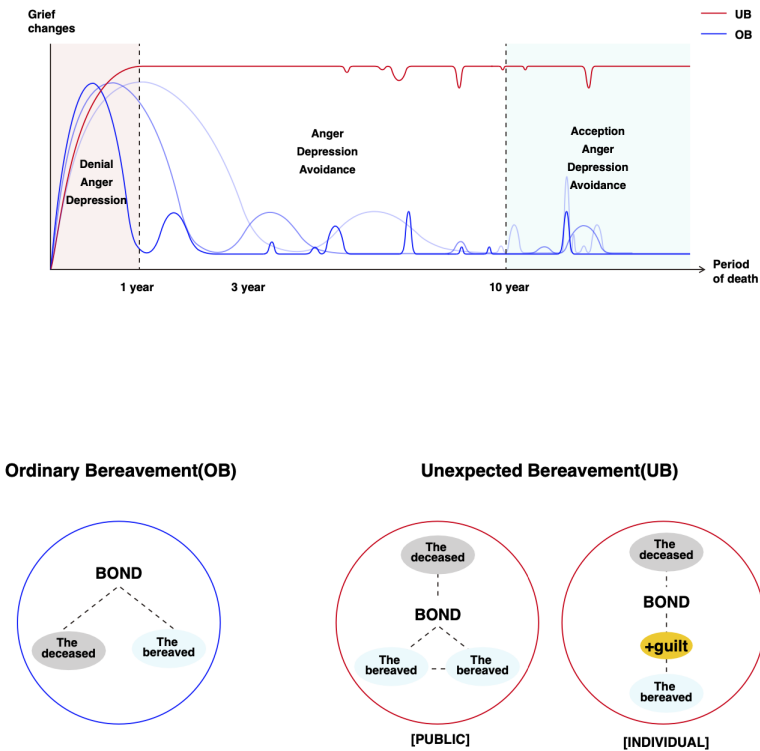
Figure 3.3 Reinterpretation of the Process of Grief and Bereavement in Different Situations

3.4. Design Concept

After finding insights and defining the target, I realised that the bereaved people who seek to maintain continuing bonds need something to evoke the deceased. Therefore, I developed the initial concept as a "channel" to evoke the deceased.

Here are the considerations I've taken into account for the concept as a channel:

1. The channel should be an artefact

People commonly take out photos of the deceased when they miss them and most related works focus on visual aspect for remembrance of the deceased, but I wanted to create a different channel. I drew on Massimi et al's study which noted how creating a personal and meaningful artefact could support a new relationship between the deceased and the bereaved (Massimi and Baecker 2011). A personal and meaningful artefact would be suitable because physical objects are often used as catalysts to trigger remembrance, helping individuals manage grief and honour their relationship with the deceased person. Moreover, I also found that psychotherapy recommends bringing symbolic objects of the deceased such as photos, perfumes or audiotapes which can help the bereaved to express their emotions and to create intimacy with the deceased (Worden et al. 2018). Therefore, the direction reached was that some sort of artefact was the most efficient channel for long-term use and maintaining continuing bonds between the deceased and the bereaved.

2. The artefact should interact between the deceased and the bereaved through childhood memory

The artefact could take the form of a ring, a doll, or a memorial monument, but my intention was to actualise interaction with the unseen and untouchable deceased through this artefact and through continuing bonds. To achieve this, I focused on the memories of the deceased. In in-depth interviews, participants shared childhood memories when describing the deceased, some relating the scent of the deceased to memories from their childhood. Therefore, I wanted to give them a means to evoke the deceased through their childhood memory, and I found the element for triggering this was through human senses. As documented, par-

ticipants did not appreciate the extreme visual elements such as digital avatar or VR. Rather, my approach was to extract the image of the deceased from the bereaved memory through scent or sound. Because the image of the deceased is retained in our mind, even though it is invisible and intangible, it is the closest image of the deceased. Therefore, I aim to design this artefact in a way that allows the deceased and the bereaved to maintain continuing bonds and interact through memories of the deceased. To achieve this, I decided to use human senses to evoke memories of the deceased rather than replicate the face or body of the deceased. Thus, the artefact should not take the form of a ring, doll or memorial monument, but rather, it should emit scents and sounds which can trigger the deceased memories, and provide a tactile stimulus and light for subtle moods with the focus on an immersive atmosphere, encouraging the bereaved to recall memories of their loved ones.

3. The artefact should be bespoke

Due to the personal memories and personal emotions of the deceased, direction was towards the notion that the artefact should be personalised. Therefore, the artefact could not be universe. I assumed that the artefact should be born of a collaboration with each bereaved participant. Therefore, I had the responsibility for designing, but the common framework and elements were to be provided by long-term participants. These elements were to be designed as personalised elements based on each participant's memories of their deceased loved ones. Therefore, the participatory design approach was necessary when I worked with actual people in the long-term study.

4. The artefact will be a personal communication channel

Bereaved people generally maintain continuing bonds with the deceased through memorialisation such as a ceremony of remembrance or funerals (Woodthorpe 2011). However, in the in-depth interviews, participants expressed the opinion that existing traditional ways of honouring the deceased in South Korea and Japan are formal, following the ritual; they wanted to have a new way of continuing bonds connected to personal intimacy. Therefore, I aimed to design the artefact for individuals to feel personal intimacy with the deceased and to allow

them to use the artefact whenever they wished. Furthermore, the aim was to focus on scents and sounds which were triggering the deceased's memories. Further, in order to evoke the deceased, the artefact was to be used in a quiet solitary place. Therefore, the size and form of the artefact should not require installation in a specific location but should be portable and handheld. Since devices emitting scents and sounds needed to be incorporated into the artefact, my aim was to create the artefact to be as small and lightweight as possible, considering all these factors.
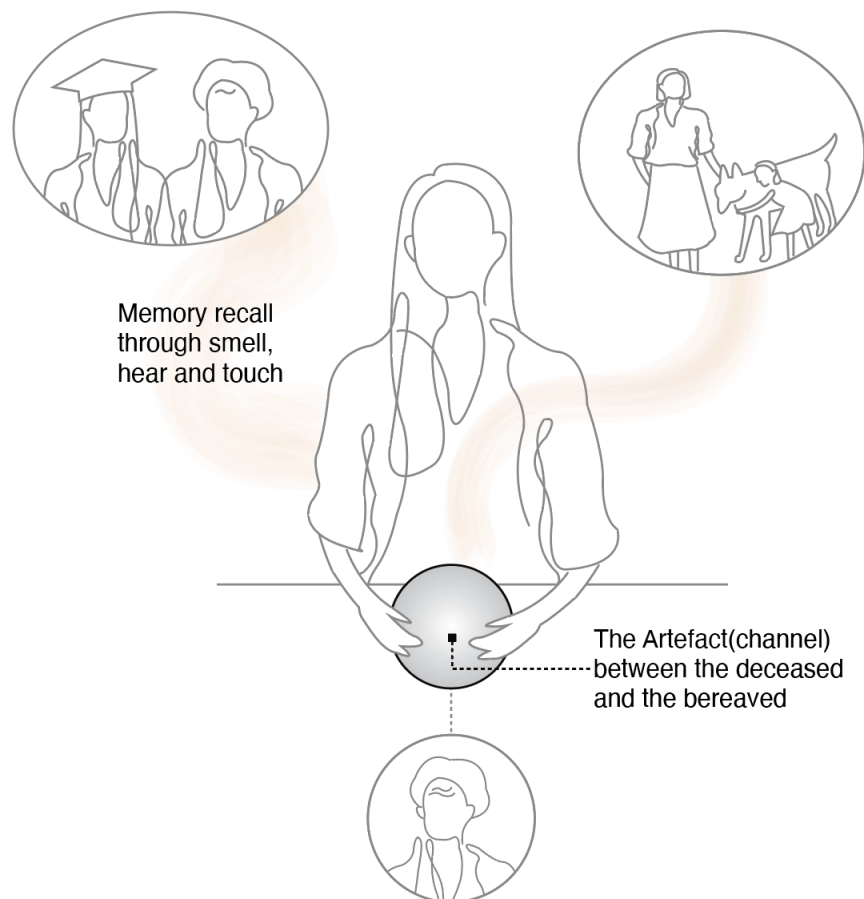
Figure 3.4 Concept Sketch of Interaction among the Channel, Memories and the Deceased

Considering the above four factors, I decided that a physical artefact which embodied multi-sensory experiences would be the most efficient channel for evoking memories of the deceased (Figure 3.5). To do so, I proposed creating an immersive atmosphere as an abstract way of using human senses such as smell, hearing and touch for the bereaved to evoke memories of their deceased loved ones from their heart, rather than relying on visual materials, hence, extreme grief-inducing experiences such as virtual reality (VR), were not employed. In addition, designing the artefact should be personal and bespoke because emotion and memory are different from person to person. Therefore, I intended to adapt the participatory design approach and allow participants to request continuous feedback and make additional requests during the long-term study if needed. The next section introduces the process of generating ideas about how to create an immersive atmosphere that triggers memories of the deceased.

3.5. Phase 1: Basic Framework Design

3.5.1 Idea Generation

During the participation in the workshop, I talked with one bereaved person. He mentioned that after losing his mother, the grief became overwhelmingly painful, leading him to seek help from a mental health clinic. A doctor recommended a deep-breathing exercise and he mentioned that this exercise helped him a lot. His story inspired me to consider ideas that could not only evoke memories of the deceased but also assist in controlling one's mind control.

One of the ideas was about incorporating lighting into an artefact, where the changing size of shadows would help users focus and guide them to take deep breaths for emotional relief. To explore this concept further, I conducted rough experiments with an Edison bulb (Figure 3.6 on the next page). I also considered my inspiration of the culture of mourning in Japan. Although a person died, family members kept the Buddhist altar at home for praying, changing flowers, occasionally placing the deceaseds' favourite foods on the altar. This evoked a sense that the family was still living together. This is not only typical in Japan, but as emerged from interview and documentaries, also in South Korea. Bereaved

South Koreans often mentioned that, even though they had burnt the deceased's belongings, they were still living together with the deceased person in their hearts. In addition, studies and design works related to heartbeat, confirmed this as a natural way to create an immersive atmosphere which can make feel a person feel calm and less anxious(Xu et al. 2021). Through this objective evidence and my subjective inspiration, I decided to use the heartbeat as a metaphor and tried to utilise a function of the heartbeat integrated it with lighting for mind control.
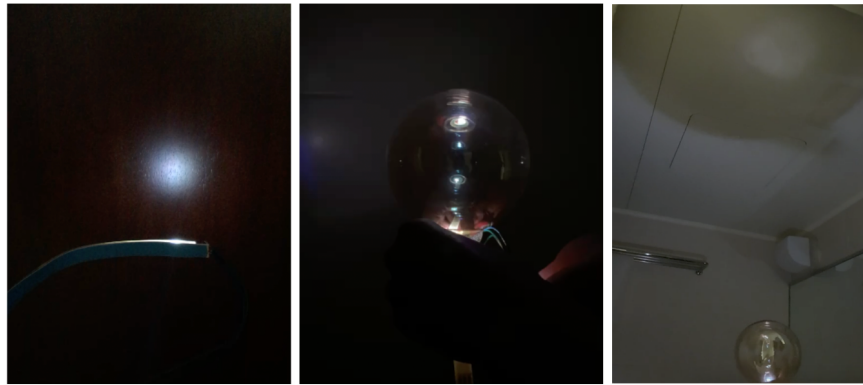
Figure 3.5 Rough Experiments with an Edison Bulb

3.5.2 Prototype Development

Implementing Heartbeat & Initial Prototype

To implement the heartbeat, I collaborated with other researchers. We had experimented and found that, using a heartbeat sensor, Arduino and an Edison light bulb, the sensor would detect my heartbeat and the Edison bulb would blink accordingly. However, I wanted to make the heartbeat sensation more prominent and more immersive than just the visible blinking of light (Figure 3.7). Inspired by Ando's project (Ando et al. 2012), I decided to incorporate a stethoscope to use the heartbeat's stimulation as one of the elements of the artefact to provide a more dramatic and emotionally comforting experience. The repeated beat of a heartbeat, as mentioned in the literature review, is used as meditation and therapy; further, it is a stimulus experienced from the mother's womb, and provides a natural sense of comfort to humans. Using the heartbeat as a symbol of life in an

element of the artefact for continuing bonds with the deceased might seem ironic, yet what truly matters is how users perceive and engage with it. Thus, I decided to experiment with the user experience when using only the heartbeat stimuli as an element.
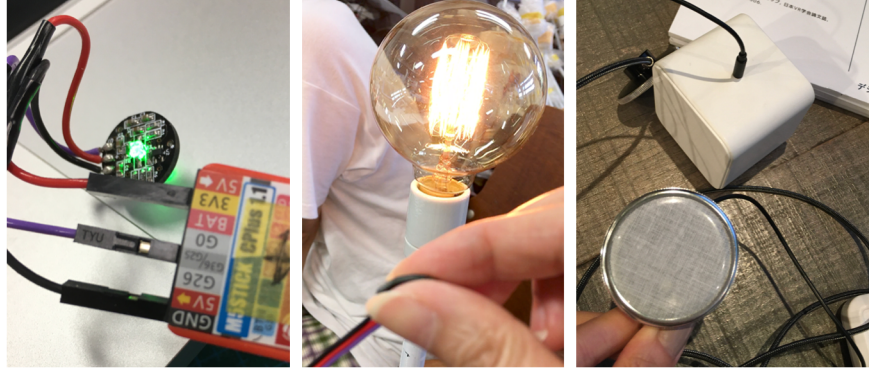
Figure 3.6 Experiment of Heartbeat Reproduction

To create the initial prototype, I recorded my own heartbeat using a stethoscope. Because people can't distinguish between their own heartbeat and others' heartbeats, the heartbeat can be shared and become a medium for feeling empathy with others around us (Ando et al. 2012). The recorded heartbeat is played as a sound via the speaker, visual stimuli using pulsating light, and haptic vibration through the actuator.

The initial prototype consisted of a wooden box featuring the following elements (Figure 3.8):

- M5 stick C plus

- SW2812B NeoPixel lighting

- 639867 vibration actuator(Foster Electric Company)

- Mylar speaker

- ESP32-WROOM-32E Bluetooth receiver(Espressif)

- NS4168 Power Amp(shenzhenshi Yongfukang Technology)
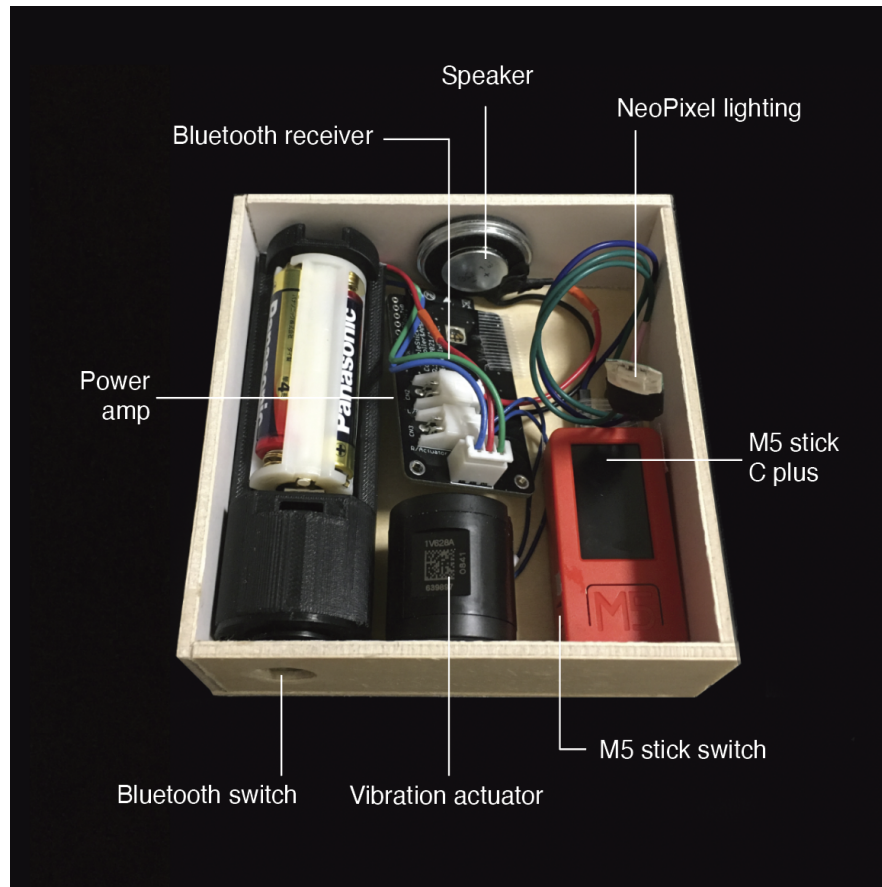
Figure 3.7 The Base Part of the Initial Prototype : A wooden box that consists of all operated elements

This initial prototype was proposed as a probe with three participants; *C*, *A* and *D* from the previous interview. Using the Lean UX method (see 3.2.4 Lean UX in Methodology section), I conducted three iterative tests to collect feedback, gradually integrating new proposed elements such as sound and scent.

1st Experiment: Heartbeat Stimuli

The first experiment was conducted on 25 August 2022, at the participant *C*'s house (Figure 3.9). Visiting participant's house forms a part of the qualitative research methods' principles: to let the participant be focused on the experiment

Figure 3.8 Heartbeat Experiment with Participant C

in her most comfortable place (Silverman 2020). In the previous in-depth interview, she had nursed her late mother for 18 years, but she still had longing and sorrow for her when she thought about her. The experiment began with her alone in her room and lasted for 20 minutes. The result was that she recalled her late father's final moments at the hospital during the experiment. In addition, the feedback from her highlighted that children, more so than parents, don't often have the chance to hear their parents' heartbeats. This is in contrast to a mother, who felt the heartbeat of her fetus. Another feedback came from Dr.Bum-seok Kim, a professor at Seoul National University Hospital. The doctor worked in a specialised field dealing with cancer of the lungs and blood tumors. S/he noted that "Pregnant mothers are reminded of the fetus by listening to the heartbeat of the fetus, but in fact, we rarely hear the heartbeat of our parents." Regarding the first experiment, it became evident that relying solely on heartbeat stimuli to evoke memories of the deceased proved to be challenging. Participant C primarily associated the heartbeat with the hospital setting. Furthermore, noise generated by machine collisions within the prototype disrupted immersion, necessitating modifications to the prototype.

Initial Prototype Development

Before the experiment, I improved the prototype by designing the surface. My first idea was a circular shape and to create a hole in the centre for communication with the deceased or to give out scents through this hole. However, as I considered

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aesthetics and the bereaved's better experience of the heartbeat stimuli, I realised that a different unique design would be more suitable. Considering the form extensively, I decided to design it with an organic shape that could be easily gripped by the hand. Therefore, by referencing various organic shapes of lighting designs including those by renowned organic shape designer, Karim Rashid and others, I brainstormed and designed the surface of the prototype (Figure 3.10 on next page).
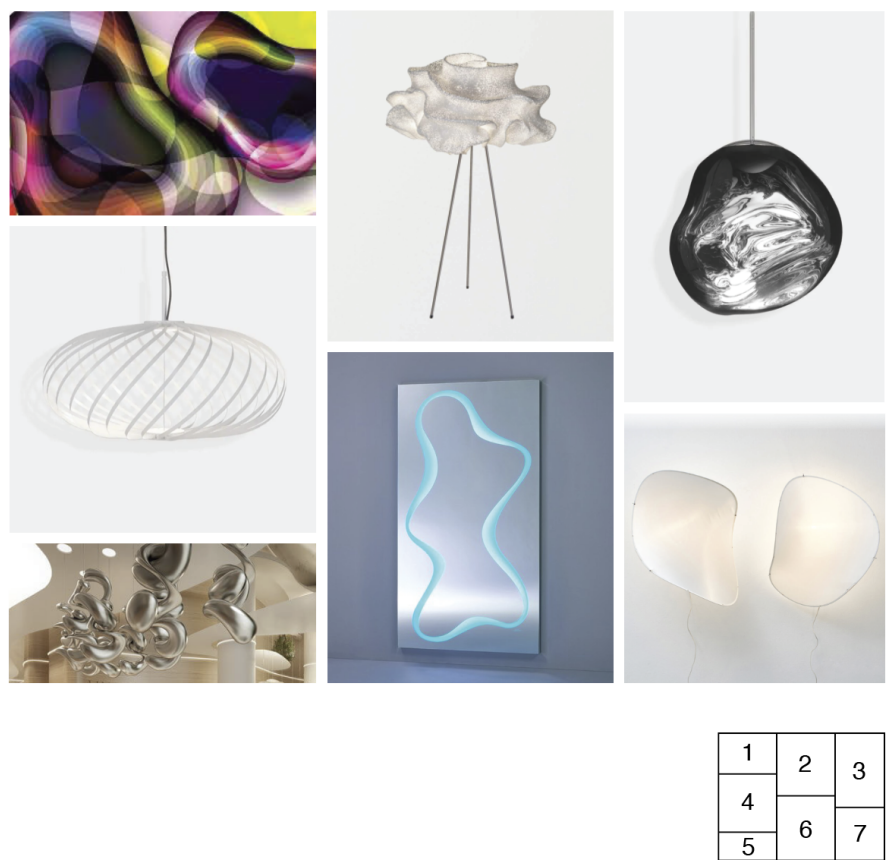
Figure 3.9 Mood Board of Referencing Surface Design (1.5.6. ©Karim Rashid, 2. ©Arturo Álvarez, 3.4. ©Tom Dixon, 7. ©Saint Germain Lumiere)

In terms of the material of the surface, at first, I considered using materials like glass or opaque ceramics. However, due to the nature of the prototype and the goal of testing and iterating quickly, I decided that 3D printing would be more suitable.

In this regard, I used a 3D printer to create a prototype that closely aligned with my concept. I tested it with different materials in South Korea and Japan. The materials were PLA(PolyLactic Acid) filament and TPU(Thermoplastic Poly Urethane) filament that were the most commonly used materials for 3D printers, and I tested different thicknesses. Ultimately, I used the 'Elastomer' which is a flexible material that offers a soft and comfortable grip for bereaved individuals (Figure 3.11). After that, I utilised a 3D printer(Stratasys J55) to create a translucent surface. In addition, I slightly increased the size of the wooden box (which forms the base of the prototype), compared to the previous one. This was to address noise from machine collisions and securely fasten each of the elements.

Figure 3.10 Process of Surface Design (Left: Initial Idea of Design, Mid: Rendering of Applying Organic Shape, Right: Comparison of the Soft Strength of Elastomer)

2nd Experiment: Heartbeat Stimuli + Smell

Participant C stated that the heartbeat sound triggered memories of the hospital and the final moments of the life of her father. This led me to reflect on the fact that a sole focus on a heartbeat could trigger negative memories associated with the beeping monitors of hospitals. Therefore, I conducted a second iteration which combined an olfactory experience with another Korean participant A. The reason for deciding to conduct a second experiment with participant A is that she shared in an in-depth interview that the scent of a lotion called *Aramis* which her late father had used for about a decade during her childhood could vividly

evoke memories of him. She had initially hesitated to recall her late father due to feelings of regret for not being more affable towards him before his passing. However, during the interview, she mentioned that her mood had improved.
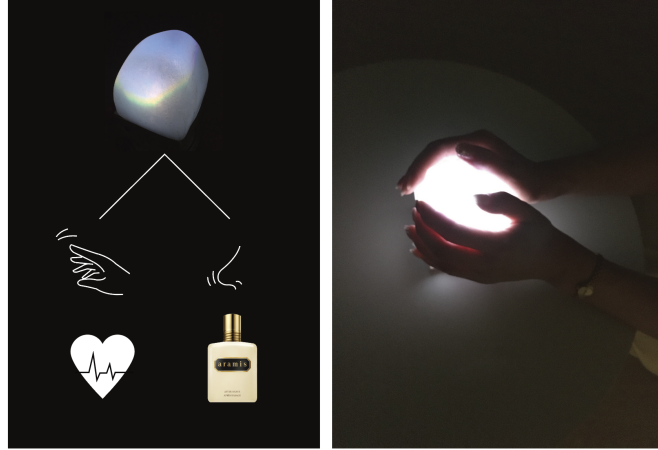
Figure 3.11 Combining Olfactory Experience with Heartbeat Stimuli

The second experiment took place on 15 September 2022 in my house (Figure 3.12). Before the experiment, I obtained her consent and informed her that it was a prototype experiment for evoking a sense of bond with the deceased, but I did not provide specific details about using scents or heartbeats. The distinct scent of *Aramis* which was associated with her late father was applied to the developed prototype. As the participant *A* entered the experiment room without prior knowledge of the elements involved, she instantly noticed the scent which made her smile. She expressed surprise at how pleasant the *Aramis* scent was, despite it being a strong and common lotion typically used by men. She mentioned that combining the scent and the repeated heartbeat stimuli created a relaxed and comfortable atmosphere. During this experiment, she described a specific childhood memory of her late father. She recalled him humming a song during a family trip to Europe when she was fifteen. She sometime remembered the song's chorus in her head, but she had never tried to search for the name. After the experiment, she tried to search for the chorus she remembered and eventually found the song title, "Heal the World" by Michael Jackson.

"Your research feels like journey collecting scattered memories of my late father."

3rd Experiment: Heartbeat Stimuli + Smell + Sound

After this second session, I decided to combine an auditory element to create a richer trigger. The third experiment was conducted with Japanese participant D, who decided to invite his family to be part of the experiment. Participant D's grandfather had passed away 7 years earlier (as of 2022). He lived with his grandparents until he got married and had a deep respect for his grandfather. Although his family was not Buddhist, they maintained a Buddhist altar as is the traditional ritual in Japan, to honor and pray for his late grandfather. However, Participant D wished to have a personal conversation with his late grandfather, free from religious rituals. He felt unsatisfied with the idea of communicating through a monk or visiting a temple.

Figure 3.12 Customising prototype: photo of putting in Japanese Mint Candy called "Jintan"

Before the experiments, I let D's family have a discussion regarding representative scent and sound of the deceased, they chose the smell of *Japanese mint candy called "Jintan"* and the music of the *Argentine tango*. I applied those elements into the developed prototype. I bought the *Japanese mint candy* which has a very

strong smell, then put them into the wooden box (Figure 3.13). I also applied the music of *Argentine tango* that *D* sent me into the prototype by connecting it to Bluetooth. The experiment was conducted at participant *D*'s parents' house on 17 September 2022 (Figure 3.14). Participant *D*, his parents, and his grandmother who was the deceased wife took part in the experiment. The family noted that interacting with the prototype they had selected helped them to evoke the memory of the deceased loved one. In particular, his grandmother emphasised that a Buddhist altar is not solely focused on the late husband, but is intended as a place to pray for all ancestors, her late husband among them. However, she mentioned that this prototype directly evoked memories of her husband. This prototype made her feel especially connected to him thanks to the specific music and scent. The heartbeat stimuli meanwhile created a calm and comforting atmosphere.

Figure 3.13 Combining Olfactory, Auditory Experience with Heartbeat Stimuli

3.5.3 Finalised Prototype

It is known that having a bond with the deceased is a natural circumstance. However, in the past bereavement theory, many experts and the bereaved tended to avoid continuing bonds and associated grief with the bond. However, contemporary studies on bereavement emphasise that one way to resolve the feeling of loss is to create a continuing bond. Through literature reviews, interviews, workshop participation, field research and more, I discovered that the reasons for bereavement and the intensity of grief and the ways of coping with grief vary depending

on cultural, personality, environmental factors etc. However, one commonality among all participants was that they missed the deceased loved ones and wanted to preserve memories of them. Especially, in the case of South Korea, the ritual of burning the deceased's belongings made it difficult for the bereaved to preserve the memories of the deceased and to maintain continuing bonds. Moreover, the practice of recalling the deceased or having the deceased's belongings were negative view due to the shamanistic aspect in South Korea. In Japan, many people maintained continuing bonds through the Buddhist altar, yet the younger generation sought different ways to connect with the deceased rather than traditional Buddhist practices.

Traditionally, the bereavement theories primarily focus on Western countries, and the topic of bereavement is universal, which means that it is too broad depending on culture, religion and other factors. In my PhD research, I decided to focus on East Asian countries, specifically South Korea and Japan. Further, I used the term of "ordinary bereavement" to narrow down the focus of the research to typical experiences of grief following a death during their lifetime, as opposed to more exceptional or complex situations. In particular, considering the element of the heartbeat, I excluded cases of death due to miscarriages or heart attack. Therefore, I proposed an artefact that could be a channel between the bereaved and the deceased loved ones. Inspired by the field research and for the objective reason of providing a sense of stability to individuals, I chose to incorporate the element of a heartbeat into the artefact.

In the initial experiment with participant C, I observed that the use of only the heartbeat stimuli was associated with negative memories of the deceased's last moments in a hospital. In the second experiment, I conducted with participant A she described a specific scent associated with her late father during the interview. I applied the scent of *Aramis* and heartbeat stimuli in the prototype. Participants focused on the overall atmosphere created by the scent and heartbeat rather than the heartbeat itself. Participant A herself experienced a pleasant sense of calm, reminiscing about childhood memories and even recalling songs their fathers used to hum. With this successful result, in the third experiment, auditory elements were applied to the prototype. Japanese participant D and his family members took part in the third experiment. Four participants mentioned that they felt

immersed in the atmosphere; they felt calm and comforted. Notably, one participant, the widow of the deceased, who had previously maintained continuing bonds with her late husband at a traditional Japanese Buddhist altar, mentioned that this new artefact allowed her to instantly recall her husband.

To summarise, the initial artefact was hypothesised to be able to induce comfort and meditation through the heartbeat based on the literature review insights. However, for one of the specific target of bereaved participants, the applied heartbeat alone triggered recollections of the deceased's final moments in a hospital setting. Through these trial and error phases, the combination of heartbeat stimulation, olfactory and auditory experiences with immersive subdued lighting gave birth to a multi-modal artefact. It could be a channel between the deceased and the bereaved, and it allows the bereaved to create continuing bonds though their memories. The combination of scent and sound based on the heartbeat stimuli triggered the bereaved to recollect their deceased loved ones, and provided a sense of comfort.(see Figure 3.15 and 3.16)
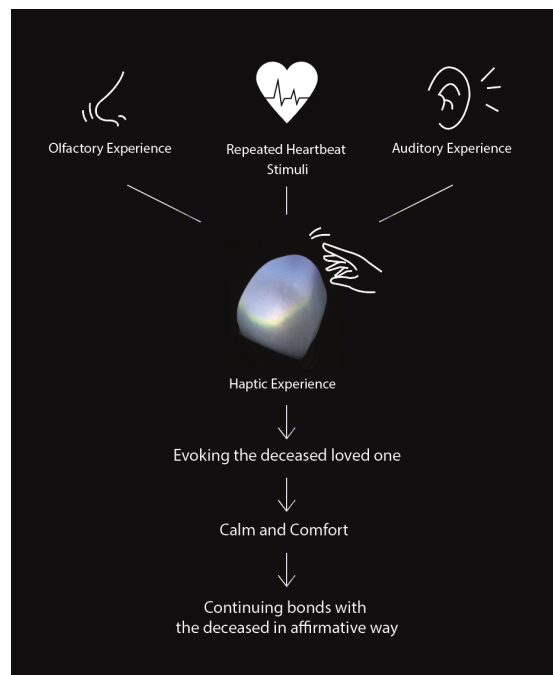
Figure 3.14 Principle Concept of the Artefact

Figure 3.15   Finalised Prototype (Top:Rendering image.   Mid:The surface for covering the base part and a subtle illumination. Latter:Prototype with lighting.)

3.5.4 Short-term Experience

Before the long-term validation, I required two participants, South Korean participant *A* and Japanese participant *D*, to keep the final prototype with them for a month and interact with it whenever they wanted. My goal was to understand the potential for longer term engagement with the artefact as well its durability ahead of the planned 4-week and more study.

Participant *A* didn't want to keep the artefact due to the South Korean culture of death as well as her guilt and depressed emotion in her in-depth interview. However, after the second experiment, her emotion had changed positively and she no longer objected to living with the artefact. Participant *D* wanted to communicate with his late grandfather through a different channel rather than a Buddhist one (mentioned from the beginning of the interview). Therefore, this participant agreed to this short-term experience. The two participants started to live with the prototypes on 18 September 2022, and were asked to keep a diary when they used the prototype.

Results

Participant *A* recorded her experiences in a diary after using the artefact (Figure 3.17 in next page). She used this artefact three times over the course of one month, mainly during the initial period. In her diary on 18 September, she used this artefact and the first use made her cry again. It was mentioned that she didn't expect to cry because she had conducted the experiment the previous week, but when the song that reminded her of late father was played through the artefact, she cried again. When she brought her face closer to the artefact to listen to the song "Heal the World" by Michael Jackson, the scent became more distinct and it comforted her. She was surprised that she became emotionally stable even though it wasn't the typical aroma associated with emotional calm. Due to her busy work, she didn't have much time for using the artefact. But she put it on the dressing table by her bedside, she used this as a scent diffuser with lighting because of the smell having a special meaning for her. On 27 September, it was noted that she smelt the scent while applying makeup, and she felt pleasant. On 1 October, she mentioned that she listened attentively before falling asleep and eventually turned it off because it made her drowsy. She was no longer sad nor

9/18
첫 사용
얼마전에 들었던 노래이니까 이번엔 들어도 크게 감정의 동요가 없을 거라고 생
각했는데 차분한 상태에서 귀를 귀울이고 들어서인지 눈물이 많이 남.
그 노래를 같이 들었던 장면이나 추억이 생각나기보단 그냥 눈물이 남.
노래 들으려고 오브젝트에 얼굴을 가까이 가져가서인지 향이 더 훅 들어오는데
일반적으로 심신안정의 향이 아닐텐데 마음이 편안함. 좋음

* 노래 소리가 너무 작음
* 심장박동이 너무 빨라서 조금 더 편안한 박동이었으면 더 좋겠음.

9/27
화장하는데 갑자기 향이 훅 느껴짐. 좋다ㅎ

10/1
자기전에. 귀기울여 듣다가 넘 졸려서 끄고 잤다. 무슨 생각을 했는지 기억이
안나지만 딱히 슬프거나 아빠 생각을 하거나 하진 않은 듯하다.
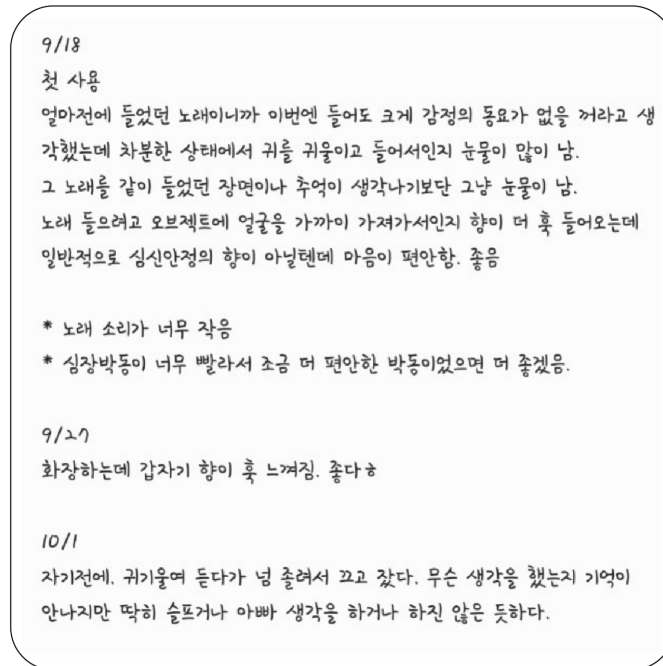
Figure 3.16 Participant A's Diary of Short-term Experience

did she think about her father at that time.

The Japanese participant *D* perceived this new artefact's context to be quite similar to that of a Buddhist altar, with elements like the sound of a bell and the scent of incense. The distinctive feature was the heartbeat stimulation. He shared that the heartbeat made him feel like his late grandfather was right there with him. However, he wasn't quite sure what to do with it. He requested a meeting with me at the end of September. During our conversation, he expressed that he had naturally learnt the ritual of praying in front of a Buddhist altar, yet this artefact was a new and unique experience, thus he wanted to receive guidelines on how to use it or possibly to have a specific purpose or mission associated with it. Due to his request, I created "5-days template (Figure 3.18 in next page)" and provided him on 14 October. The reason for choosing five days was firstly, it was due to the approaching end of the experiment period. Secondly, based on the qualitative research in my Master's thesis [4], a five-day period is the period

Figure 3.17 Participant D's 5-days Template

of too short to waste of time. It makes a participant intensively concentrate on this experience. The question I provided was "Please evoke a specific memory (good or bad) with your deceased and talk with him about it". The purpose was to observe if evoking the memories of the deceased using these questions would create a continuing bond. In the template, participant D could record the rate of the level of the bond and the intensity of grief on a scale from 0 to 10. Additionally, I left a space for him to describe his emotional state for that day. His first reaction was to feel awkward about communicating with the deceased through the artefact, as time passed, his bonding went deeper and deeper. On day 1, he initially recalled his late grandfather due to the scent and later on day 2, memories were evoked from his childhood, specifically moments by the Shimoda sea. These recollections created continuing bonds with his late grandfather. The bond between him and his late grandfather rose from the scale 0 to 8 over a short period of time. There were moments of sadness on day 3, upon reviewing the

daily records, it is mentioned that the heartbeat stimulation gave him a feeling as if his grandfather were still alive. He shared recent personal stories with his grandfather and felt bittersweet emotions. The result showed that the template encouraged him to use the artefact intensively at the end.

Findings and Insights

In terms of the results for participant A, the analysis showed that the lack of compulsion and her busy life resulted in infrequent use of the artefact, and this situation made for less evocation of the deceased. Furthermore, there was some feedback that the song was weak and the heartbeat was too fast. She suggested that a slower heartbeat would be comfortable. It became evident that another improvement of the prototype was necessary. In addition, participant A and D used the artefact in different ways respectively: participant D was guided especially by the "5-day template" which encouraged more intensive engagement with the experience. This short-term experience provided valuable insights into the design of the long-term study. It highlighted the need for adjusting the speed of heartbeat and volume of sound, a guide or a template as to how to use this artefact, and also a frequent interview for engagement was needed for validation.

3.5.5 Finalised Research Product *Be.side*

Through feedback from the short-term experience, I decided to develop the artefact as a "research product". While 'Prototypes' usually refers to something in-progress, and with the aim of finding the potential of the concept, a 'research product' helps to overcome the barrier of prototypes when users focus on their experience. The latter is more concrete as a product so that users can focus on their experience, yet it is different from a product that is produced on a commercial scale and volume (Odom et al. 2016).

1. To address the feedback of the noise caused by the collision of actuators and the M5 stick inside the wooden box, I increased the width and length size of the base box from 9cm to 10.5cm respectively, and secured the positions of each element. I also changed the base box, which was produced using a PLA Filament

material with a 3D printer rather than a wooden box.

The final elements of research product are below (Figure 3.18):

- M5 Atom

- 639867 vibration actuator(Foster Electric Company)

- Mylar speaker

- ESP32-WROOM-32E Bluetooth receiver(Espressif)

- NS4168 Power Amp(shenzhenshi Yongfukang Technology)

2. One feedback was that two switches of M5 stick for lighting and Bluetooth made the use complicated. Therefore, I used the M5 Atom instead of the M5 Stick, which already had built-in NeoPixel lighting. This eliminated the need for a separate lighting component and allowed a single on/off switch (Figure 3.18).

3. Participants requested some instruction as to how to use *Be.side*. Thus, I designed some supplementary materials including an instruction manual and a Question book. The Question book led the bereaved into a conversation with the deceased. The questions were derived from interviews content and well-known bereavement questionnaires (e.g., BCG).

4. Regarding the design elements, I received feedback that the heartbeat was slightly too fast. Su-guen Im, a psychiatrist, noted that a normal heart rate tends to be a bit faster, for example, the resting heart rate for adults ranges from 60 to 100 beats per minute. He suggested that slowing it down slightly could provide users with a greater sense of immersion and stability. In addition, one of the literature reviews indicated that slowing down heartbeat stimuli reduced participants' anxiety (Xu et al. 2021). Furthermore, I conducted an expert interview with Prof. Minagawa from the Psychology Department at Keio University on 26 January, 2023. She agreed that normally, heartbeat stimulation was helpful in
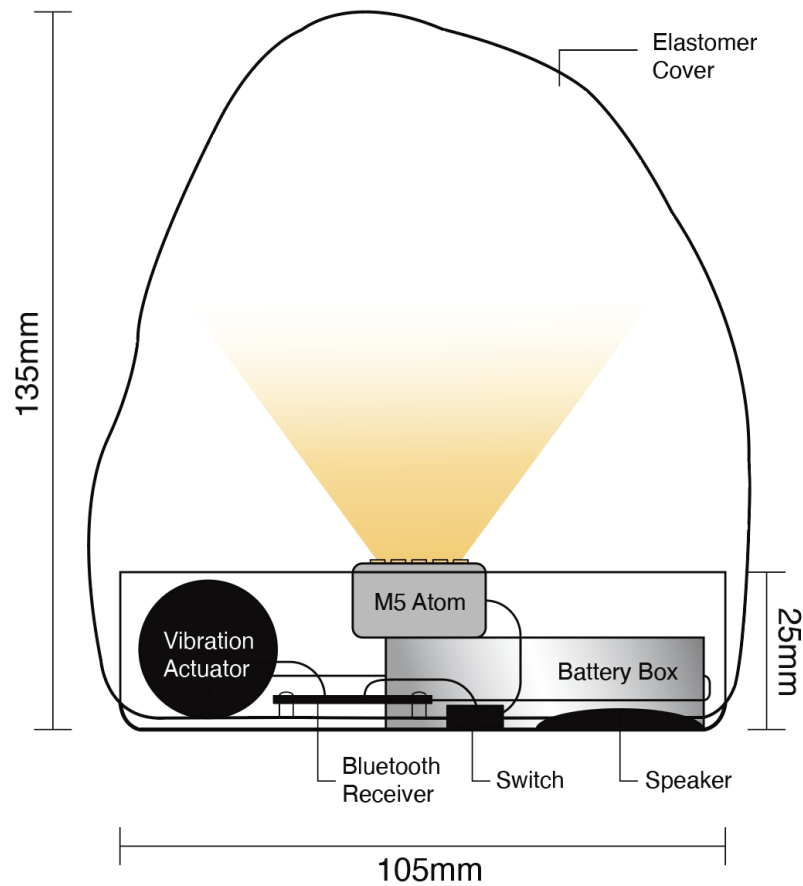
Figure 3.18 Construction Sketch of *Be.side*

changing people's emotions. Based on several of her research studies, she recommended adjusting the optimal heartbeat speed for each participant because each person has a different comfortable speed. This was one of the reasons for using a participatory design approach. It was necessary to adjust the appropriate heartbeat speed for each participant.

5. I modified the surface shape to a more organic one which the user could grab more comfortably. I tested the thickness of *Elastomer* several times to create a translucent light which promotes immersion. It meant that participants could adjust the colour and brightness of the lighting.

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6. Finally, I designed the name and the logo, and offered the artefact as a toolkit including an instruction manual and a recording book.

The final research product is called "*Be.side*" (Figure 3.19). *Be.side* is a multimodal artefact, of hand-wrapped size with translucent lighting that consists of three elements: scent, sound and heartbeat simulation, each acting as a catalyst that supports a bereaved person in evoking memories of a deceased loved one. The name *Be.side* has a dual meaning. Initially, it refers to the concept of being *"next to someone or something"*; it indicates the hope that this artefact can contribute to the bereaved feeling closer to the deceased loved ones. Secondly, the 'full stop' between 'Be' and 'side' implies a subtle directive to keep it close or beside you. *Be.side* is included an 'Instruction manual' and an optional 'Question book', together forming a whole package that could be used to guide conversation between the bereaved and the deceased (Figure 3.20, 3.21). These questions were intended as prompt which could help the bereaved to start a one-sided conversation with the deceased and let them recall various memories. The questions were generated based on continuing bonds theory.

- Any happy moments recently that you want to share with the deceased person?

- Is there anything you would like to tell the deceased person?

- How was your day today? Would you like to share it with your deceased loved one?

- Any concern you would like to share with them?

In terms of logo design, the symbol indicates the form of artefact, I used the 'American Typewriter' which is slab serif font to create logo because slab serif font is not too classic or modern; it is fit for my concept of designing a modern artefact for the serious topic of bereavement (Figure 3.22). The colour choice includes contrasting shades of orange series and navy series, signifying the contrast between life and death, as well as the bereaved and the deceased, and using the gradation between orange and navy, I wanted to represent the immersive atmosphere. This logo is applied in the instruction manual, Question book, and package (Figure

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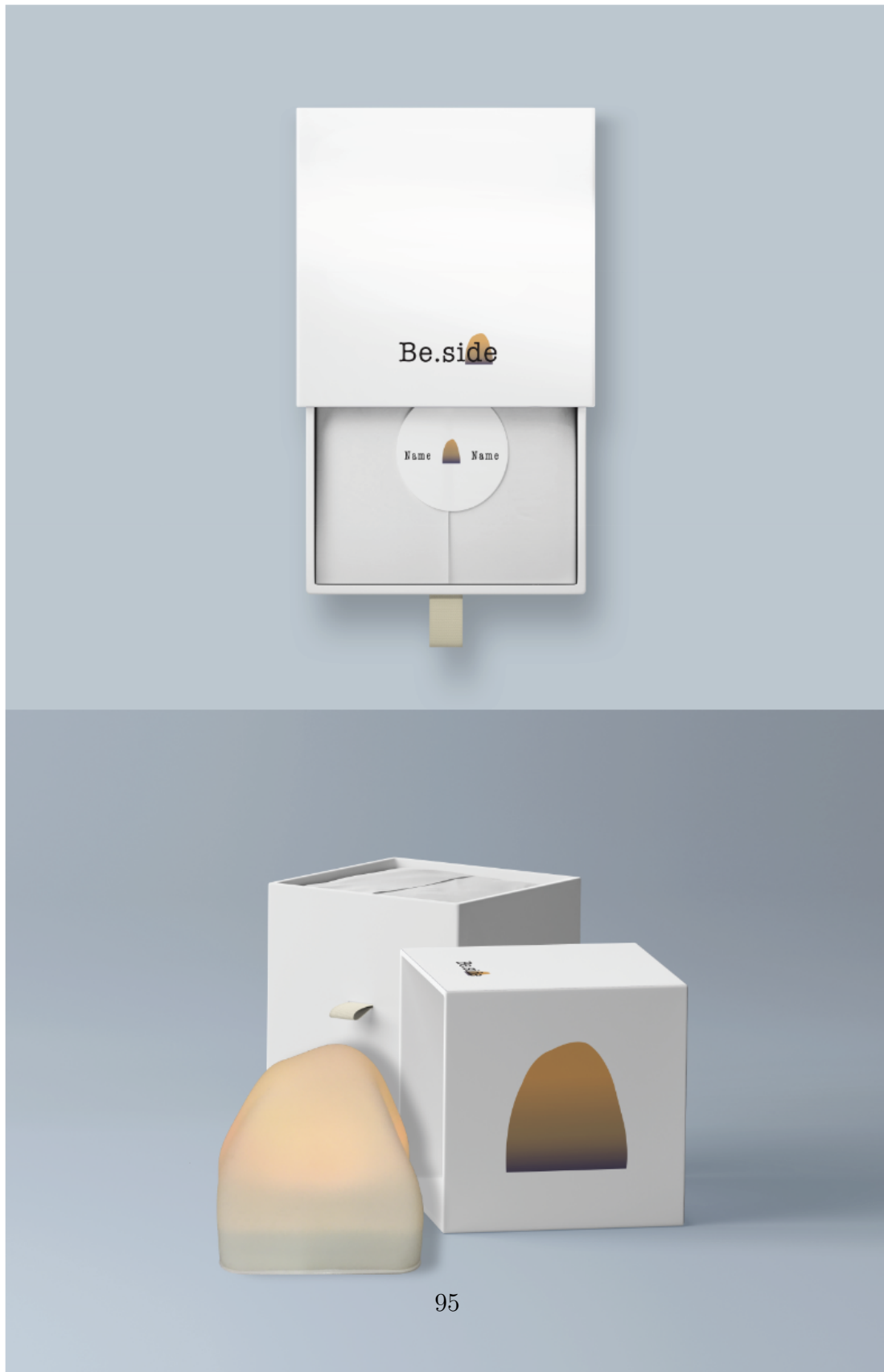
Figure 3.19   *Be.side* with a Package

3.23, 3.24). In the application of the Question book cover and the sticker from the package, the symbol is placed between the name of the bereaved and the deceased to show the connection through *Be.side.*

3.5.6 Concept Summary

The initial concept was to create a channel between the deceased and the bereaved, and the channel could involve indirect ways to evoke memories of the deceased for maintaining continuing bonds; in turn, this would contribute to the bereaved in recreating their new relationship with the deceased. To achieve this, I first focused on the connection between human senses and memory evocation. I aimed to evoke memories of the deceased from the participants' childhood memories by scent and sounds rather than a replicated physical or virtual face or body of the deceased. Furthermore, to promote immersion in this atmosphere and provide comfort, I decided to use repeated heartbeat stimuli. When applying only the heartbeat stimuli to the initial prototype, it evoked memories of the deceased's last moments in the hospital. After gaining insights that applying only the heartbeat could recall sad memories, I added scent and sound: in this way, the participants could evoke the deceased memories, make the experience more immersive from the repeated heartbeat stimuli and feel a sense of stability. Therefore, the final concept is to create a multi-modal artefact which has a combination of scent, sound and regular heartbeat stimuli. As the channel, it creates continuing bonds between the deceased and the bereaved.

Here is a key point of concept of *Be.side*:

1. Function

By incorporating scents and sounds that vividly evoke memories of the deceased in an abstract manner, *Be.side* allows participants to reminisce about the deceased, fostering a continuing bond. Considering ethical considerations, extremely visual elements are excluded; subtle lighting and the element of heartbeat stimuli are utilised for immersion and comfort.
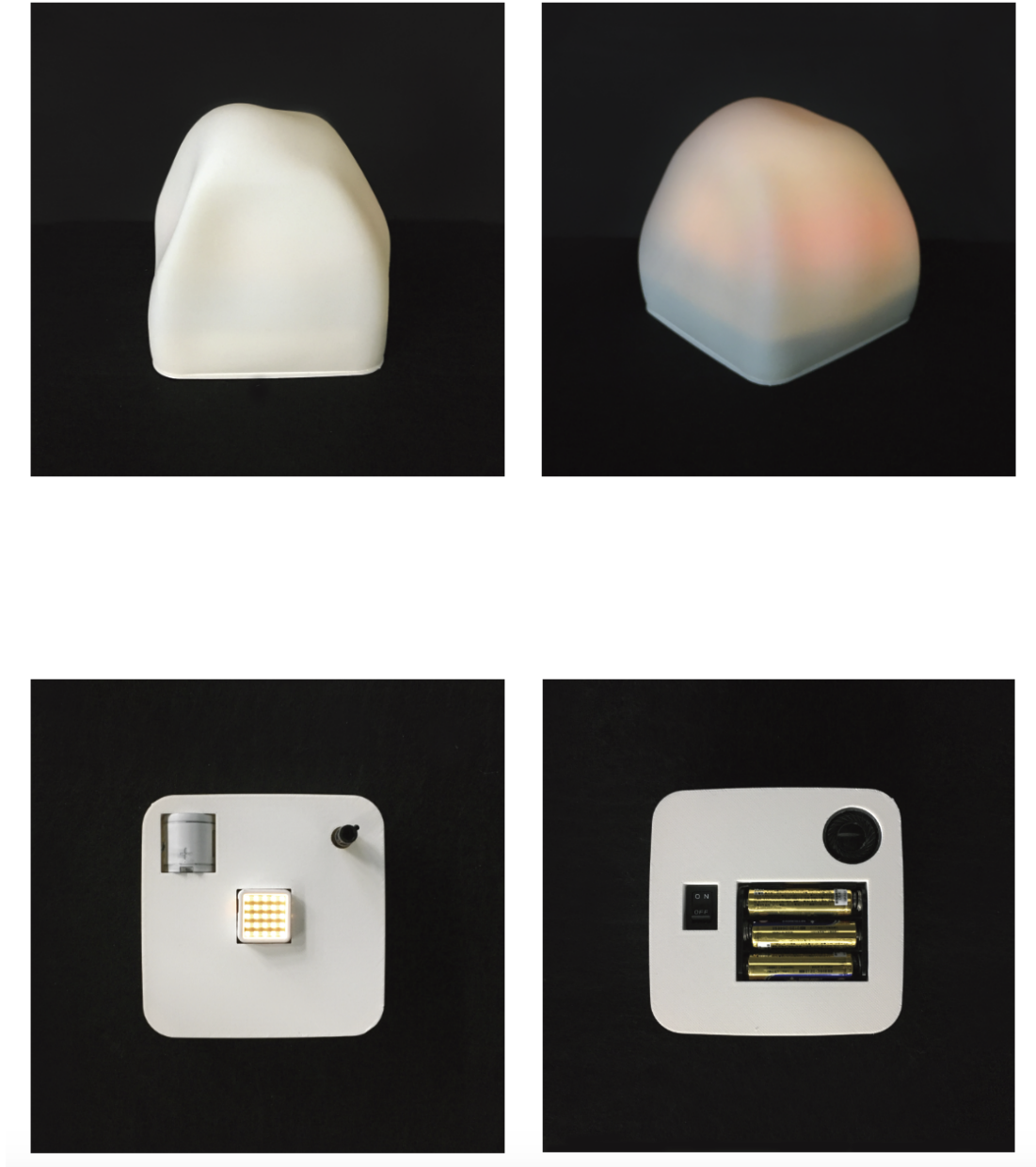
Figure 3.20 Research Product "*Be.side*"

Figure 3.21 *Be.side* with an Instruction Manual and a Question Book

Be.side

LOGOTYPE

GRID

Be.side

Be.side

SYMBOL

MINIMUM SIZE

Be.side | 1cm

COLOUR

C: 3.91%
M: 35%
Y: 61%
K: 0%

C: 27.54%
M: 39%
Y: 58.86%
K: 0.31%

C: 79.61%
M: 70.59%
Y: 0%
K: 48%
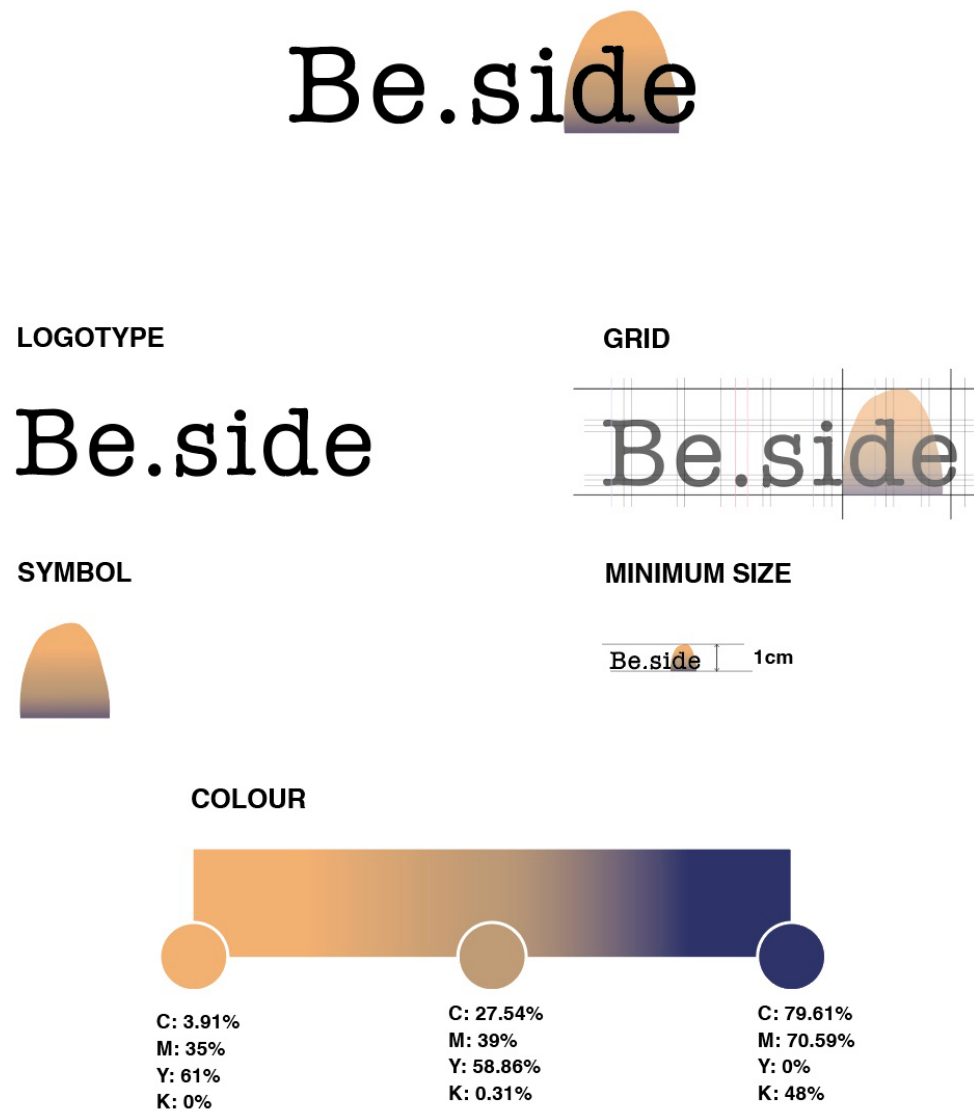
Figure 3.22 Final Logo and Logo Guidelines
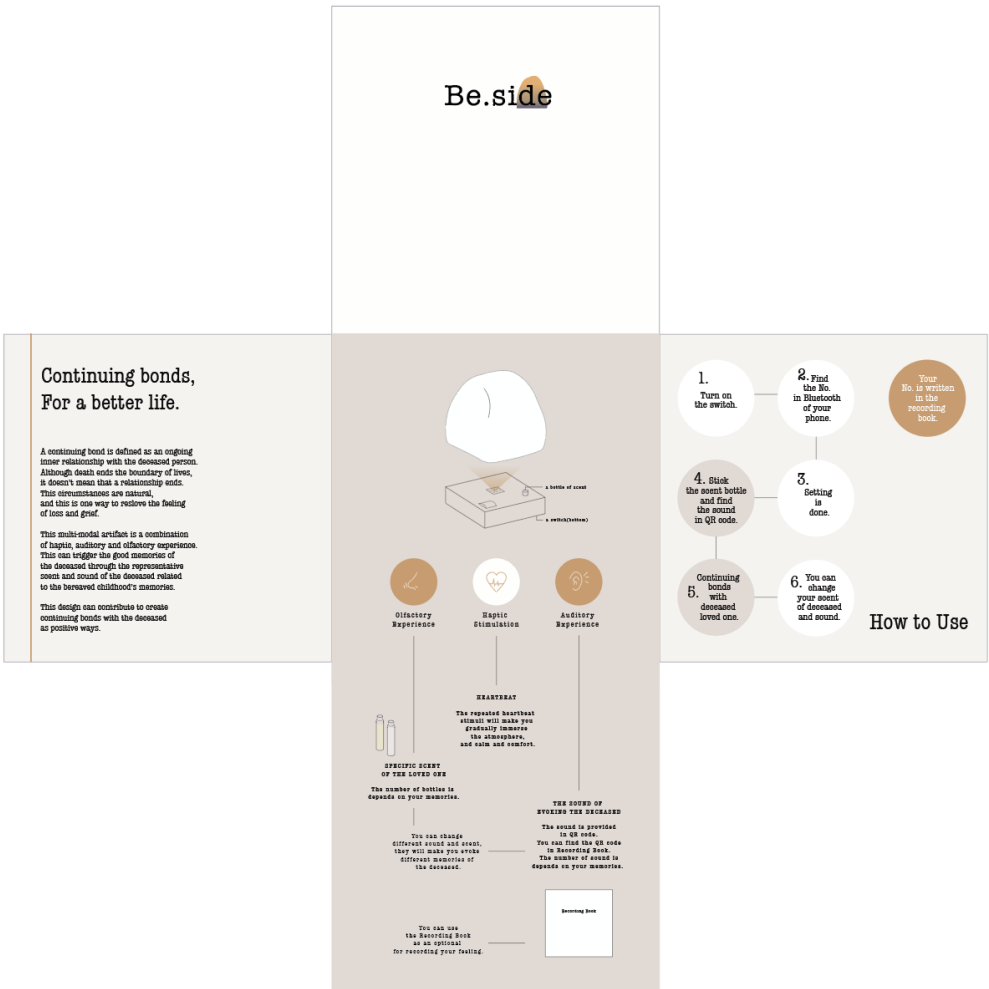
Figure 3.23 Details of an Instruction Manual
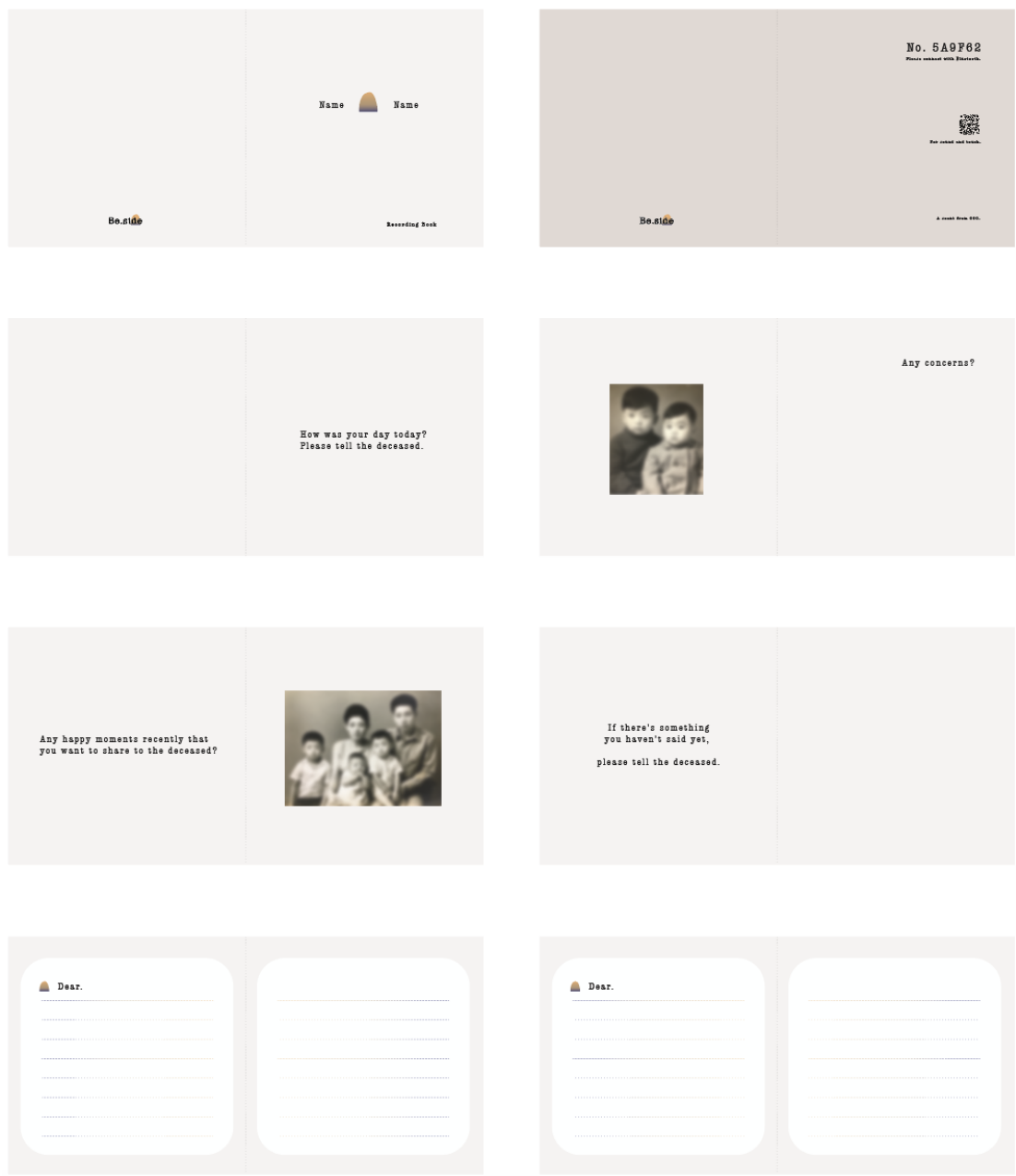
Figure 3.24 Details of a Question Book

2. Form

Through several experiments, it was observed that participants tended to use the prototype in quiet, solitary conditions. In addition, participants were found to grasp the prototype in their hands, to hug it or bring it close to their ears. This led to the idea that the artefact should be crafted with an organic form. Therefore, I used an *Elastomer* which is a flexible material, dimensions of approximately 11-13 centimetres in width and height, which is the most suitable size and shape for grasping the artefact and allowing it to be squeezed or hugged based on the emotional needs of the bereaved participants.

3. Iterative Development via Participatory Design

Be.side is a personalised design due to the personal nature of memories and grief. Therefore, I will collaborate with bereaved participants, who are given space for ideas of elements of sound and scent requested by the participants themselves. Therefore, we discuss which memories of the deceased will be replicated and adjust ideas together. In terms of "iterative", one of the characteristics of participatory design, and in terms of the personal topic, I will allow participants to require continuous feedback and request. In addition, it was essential to avoid monotony in evoking memories of the deceased using the same elements in long-term research, as this could potentially lead to a decrease in engagement. Therefore, the repetition of participatory design was deemed necessary.

4. How to communicate with the channel, *Be.side*

Participants first turn on the *Be.side*, then connect it to Bluetooth. They can immerse themselves in the atmosphere of the combination, recollect memories associated with those scents and sounds, and occasionally use the Question book to communicate with their deceased loved ones. It is recommended to use it four times a week for 5 to 15 minutes each, based on the psychiatrist's advice and considerations for participants' daily routines.

3.6. Phase 2: Participatory Design

3.6.1 Participants

I aimed to create a bespoke *Be.side* via a participatory design approach. Participatory design was conducted before the long-term study, I allowed participants to request additional requests during the long-term study. Participants were recruited using flyers distributed at communities on death and bereavement and a Japanese community of people living in South Korea and by word of mouth from past interviewees between the start of February and the end of March 2023. The criteria for recruitment were individuals who had experienced the loss of a loved one at least six months ago and who had a good relationship with the deceased while they were alive. After an initial meeting with volunteers, three participants who fitted the inclusion criteria and wanted to engage actively in the long-term experience were identified. Participants are hereafter referred to using pseudonyms.

Min(**P1**): A South Korean man, in his early 40s. He lost his grandfather 11 years ago. He had been closer to his grandfather than his own father, and he felt the grandfather had greatly influenced his life. He sometimes recalled his late grandfather and missed him, but he only had a picture to remember him by. He regretted that he never got the chance to take a video and record his voice. He hoped that through participation in this research he could evoke his grandfather in new ways.

Yui(**P2**): A Japanese woman in her early 30s, her father passed away 1 year ago. Remembering her late father, still caused her sadness. Thus, she often tried not to think of him, yet she could't help it because she still missed him. She didn't know how to navigate her emotions and thought that participating in the research could help her develop a new relationship with him.

Nara(**P3**): A South Korean woman in her late 30s, whose father passed away 12 years ago. She had took part in previous stages of the research (participant A) and was interested in being involved in a longer-term study with the *Be.side* artefact.

Table 3.2 Schedule of Min(P1)'s participatory design and Long-term Study

Phase	Date	Duration	Location	Activity
1st Meeting	16.Feb	30 mins	Cafe	Selection of participants
2nd Meeting	21.Feb	1 hour	His home	Rapport building, Questionnaire
3rd Meeting	27.Feb	90 mins	His home	Rapport building, Informed consent to participants
4th Meeting	4.Mar	40 mins	His home	Adjusting bespoke elements of *Be.side*
Delivering	10.Mar	-	-	Start living with *Be.side*
1st Interview	17.Mar	40 mins	His home	Semi-structured interview
2nd Interview	27.Mar	30 mins	His office	Semi-structured interview
3rd Interview	3.Apr	40 mins	His office	Semi-structured interview, Min requested another elements
Delivering	20.Apr	-	-	Adding another elements
4th Interview	30.Apr	1 hour	His office	Semi-structured interview

Table 3.3 Schedule of Yui(P2)'s participatory design and Long-term Study

Phase	Date	Duration	Location	Activity
1st Meeting	21.Mar	30 mins	Zoom	Selection of participants
2nd Meeting	23.Mar	40 mins	Cafe	Rapport building, Questionnaire
3rd Meeting	30.Mar	1 hour	Zoom	Rapport building, Informed consent to participants
4th Meeting	14.Apr	40 mins	Her shop	Adjusting bespoke elements of *Be.side*
Delivering	16.Apr	-	-	Start living with *Be.side*
1st Interview	24.Apr	40 mins	Zoom	Semi-structured interview
2nd Interview	1.May	40 mins	Zoom	Semi-structured interview, She requested to insert a photo of the deceased and another Question book for her sister
Delivering	8.May	-	-	Start using the applied photo ver.
Travelling	12-15.May	-	-	Yui's visit to Japan
3rd Interview	17.May	1 hour	Her shop	Semi-structured interview
4th Interview	24.May	40 mins	Cafe	Semi-structured interview

Table 3.4 Schedule of Nara(P3)'s participatory design and Long-term Study

Phase	Date	Duration	Location	Activity
Meeting	16.Apr	40 mins	Author's home	Adjusting bespoke elements of *Be.side*, Informed consent to participants
Delivering	16.Apr	-	-	Start living with *Be.side*
1st Interview	24.Apr	40 mins	Zoom	Semi-structured interview
2nd Interview	1.May	1 hour	Cafe	Semi-structured interview
3rd Interview	9.May	30 mins	Cafe	Semi-structured interview
Rest	1 week	-	-	Considering her well-being
4th Interview	23.May	40 mins	Her home	Semi-structured interview

3.6.2 A Bespoke Artefact, *Be.side*

Regarding each element, scent, sound, speed of heartbeat, and lighting, I conducted several pre-meetings with the three participants to understand their needs and thoughts, also building a rapport. I provided them with opportunities to contribute ideas, and together, we selected the most suitable scents and sounds associated with the deceased. Participants could choose the most suitable scent and sound from replicated them that I provided, I allowed for additional requests during the long-term study based on characteristic of participatory design. Throughout several trials and conversations with three participants, I worked with each individual to finalise scent, sound and speed of the heartbeat for their bespoke version of *Be.side*. I provide the details and motivation for each below.

1. Participant: Min (P1)

Min's grandfather ran a pharmacy near his house. According to *Min*'s memory, his grandfather always kept the TV on in the background on the NHK news channel. He remembered that as a child when he opened the door to his grandfather's room, he could smell the scent of a typical Korean medicine from the pharmacy,

and hear Japanese words that he could not understand.

1) Sound: We decided to use the sound of NHK, and found a broadcasts from 1985, when he was a child.

2) Scent: In terms of smell, I and *Min* conducted a number of experiments. First, I prepared an ethanol and iodine mixture, but *Min* said it did not match his memories. We finally identified the smell as being associated to a medicine called Jung-ro-hwan, a typical Japanese medicine with a unique smoky smell due to the presence of Wood-tar creosote (a substance created by the distillation of wood tar). We placed some tablets inside the device to release the scent.

3) Heartbeat: The speed of the heartbeat was adjusted to 42 beats per minute which he described as serene and comfortable. The blinking of lighting was also adjusted to match the heartbeat's speed.

4) Lighting: As *Min* had poor eyesight and his eyes could easily be tired by a bright light, we adjusted the colour and brightness of *Be.side*, and limited the duration of the experience to a maximum of 5 minutes. He also shared his family's photos which we included in the Question book to support reminiscing.

2. Participant: Yui (P2)

Yui's *Be.side* prototype could reproduce the tune of the baseball team Yomiuri Giant and it smelled of barley tea. Her late father loved baseball, especially the team Yomiuri Giants. She recalled that he always watched baseball games on TV. In addition, he loved Japanese alcohol, and he had the peculiar habit of drinking it mixed with barley tea. While he enjoyed a drink watching the baseball game, her mother cooked some snacks and afterwards the family would go out together for an evening stroll.

1) Sound: Therefore, I and *Yui* decided on Yomiuri Giants' cheerful song as a sound. Embedding the cheerful song of the Yomiuri Giants was an easy task: I searched for the cheerful song in their website and applied it to *Be.side*.

2) Scent: We decided on a scent like barley tea from her childhood memory. However, replicating the scent of barley tea proved to be more challenging.

Initially, I tried to replicate the scent with a perfumer, but the smell felt very artificial to the participant. In the end, I decided to put a barley tea bag inside the prototype. Moreover, I soaked the surface in brewed water of barley tea overnight, letting the smell of barley tea permeate it. As the smell barley tea is strongest when the tea is being brewed, I gave her a box of barley tea just in case.

3) Heartbeat: The speed of heartbeat was adjusted to 48 beats per minute which felt comfortable to the participant. The intensity of the vibration was also reduced due to the overlapping of the cheering song of the baseball team.

4) Lighting: Finally, I adjusted the colour and brightness of the lighting to match the one of a sunset, and set the length of the experience to 5 minutes.

3. Participant: Nara (P3)

Nara's sounds and scent were the same as she had selected during the previous phase of the short-term experience.

1) Sound: The song titled *Heal the world* by Michael Jackson was her late father's favourite song, thus she could evoke him easily when she listened to this song.

2) Scent: I found the perfume that had the same scent as "Aramis" lotion. I bought this perfume, transferred the small amount of perfume into a tiny bottle, and delivered it to her.

3) Heartbeat: The speed of the heartbeat was set to 45 beats per minute, which felt comfortable to her and the light matched the same speed.

4) Lighting: The colour and brightness of the light were the same as the ones described for *Yui* due to the fact she was satisfied the sunset colour as well.

After completing these adjustments (Figure 4.2 and 4.3), I delivered a bespoke artefact *Be.side* and the supplementary materials to each individual. In addition, I prepared a total of five artefacts *Be.side*, even though there were only three participants, as a precaution. If they require additional elements, the spare artefacts are developed to save time instead of collecting the in-use artefact and modifying it.
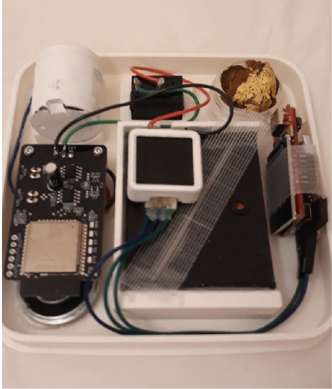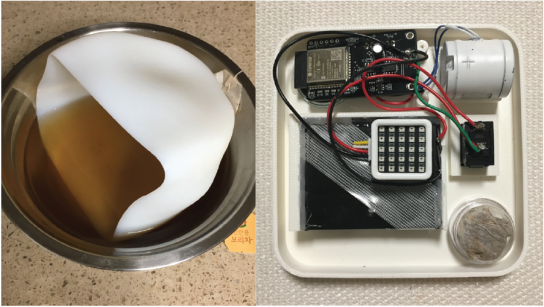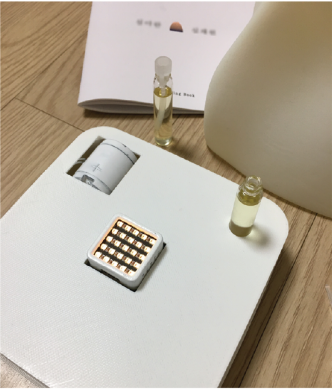
	Scent	Process of Making a Bespoke Be.side
Min (P1)	Cheongrohwan which is a strong-smell of Korean medicine.	
	Sound	
	NHK News which broadcasted in 1985 when he was a child.	
	Speed of Heartbeat	
	42 beats per a minute which makes him serenity, comfortable.	
Yui (P2)	**Scent**	
	Smell of barley tea.	
	Sound	
	Cheering song of Yomiuri Giant's baseball game.	
	Speed of Heartbeat	
	48 beats per a minute and weaker intensity due to overlapping the cheering song.	
Nara (P3)	**Scent**	
	"Aramis" perfume.	
	Sound	
	Song of "Heal the world" from Michael Jackson.	
	Speed of Heartbeat	
	45 beats per a minute which can harmonise with the song.	

Figure 3.25 Three participant's bespoke elements of scent, sound and speed of heartbeat

3.6.3 Iterative Refinement

Two participants requested additional elements during the third meeting in the Long-term study. One participant *Min (P1)* requested another memory to be replicated into scents and sounds, while participant *Yui P2)* wanted to attach her late father's photo.

Min recalled memories not only with his late grandfather but also memories involving his late grandmother. He recollected the mornings of his childhood when his grandmother used to cook breakfast, reminiscing about the sound of chopping and the scent of brunch his grandfather used to enjoy every morning. Therefore, I provided these scents and sounds once more during the long-term study. In terms of replicating the scent, one of the scents I used for "My Legacy", the Master project that I introduced in Chapter 1, was the scent of brunch. The scent was replicated with perfumers based on the data of molecular via Gas Chromatography. I provided this scent to *Min*. As for sounds, I utilized freely available sound sources, and adjusted the speed and volume with *Min*.

In terms of *Yui*'s request, it was an unexpected situation. Considering that my concept focused on evoking memories of the deceased and continuing bonds in an abstract way using olfactory, auditory and haptic experiences, I had to carefully consider how to handle this request of the visual element of the photo. In participatory design, iteration is one of the characteristics; refining the design by actively incorporating participant opinions is crucial. This was especially so given that my research topic of "a continuing bond", and *Yui*'s inclusion of her father's photo could contribute more actively to maintain continuing bonds. I, as a researcher and designer, decided to accommodate her request. Therefore, maintaining the previously mentioned design concept about the flexibility of my design, while avoiding visually distressing elements that evoke extreme grief such as that mediated via a digital avatar or VR, I have decided that when requesting a general photo, it should not be directly revealed.

Yui gave one of her favourite photos which is old, because she liked the more nostalgic atmosphere of them. I made the original photo in grey scale, decided to print the photo on film paper and attached it inside the device. This intention

was not to reveal his face directly, also when considering long-term use, it was deemed safer for the photo to be attached inside. Regarding installation, I created several experiments adjusting contrast and size. I finally designed the *Be.side* to maintain its original white Elastomer cover when not in use, i.e., when the light is off. When the light is turned on, the illumination flickers according to the speed of the heartbeat, and the father's image is faintly visible, which created an abstract and dreamlike atmosphere (Figure 4.4). *Yui* was highly satisfied with this outcome. She mentioned that seeing her father's image during use made her want to use *Be.side* more frequently. This allowed her to focus on the three core elements; scent, sound and heartbeat stimuli and permitted a more abstract atmosphere to be created.

While the basic framework of *Be.side* and the provided content including scents, sounds, heartbeat stimuli and lighting remained the same, the elements were refined in collaboration with each participant. As a result, *Be.side* could be a unique artefact that allowed them to recall their individual memories of the deceased. Throughout this process, participants continued to interact with *Be.side*, continuing bonds with the memories of their loved ones.
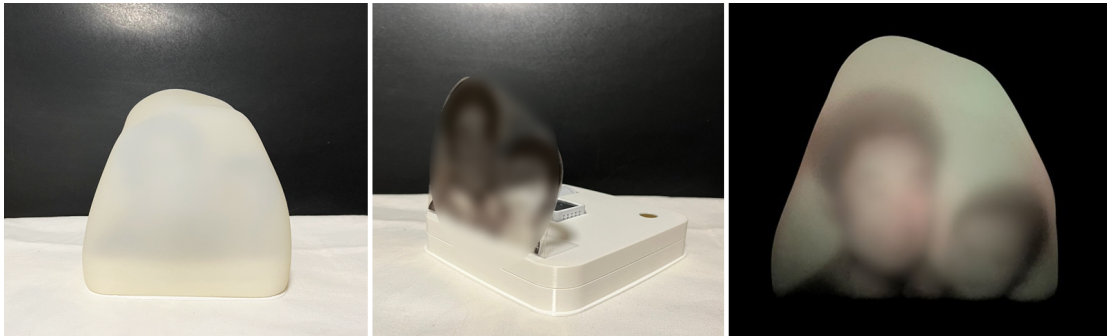
Figure 3.26   Yui's development of "*Be.side*": The late father's face was gently reflected when the light came on (This image is blurred for privacy)

Chapter 4

Proof of Concept

4.1. Overview

In this chapter, the proof of concept is laid out. The chapter establishes that
the final design addressed the challenge set up in the PhD through a long-term
study with actual users, and it is verified that the final outcome operates as
envisioned and can be turned into reality. In this regard, I applied Thematic
Analysis (Lochmiller 2021) as a qualitative research method to verify how the
bond continued with *Be.side*; how each element of *Be.side* served a specific role
in evoking memories of the deceased and how continuing bonds with the deceased
affected the bereaved lives affirmatively. In addition, I observed and reported
what participants experienced and how they made meaning out of their experi-
ences. (Klass 2006) Further, I aim to discuss the process of conducting a 4-week
long-term study with three participants using *Be.side*, as well as the data collec-
tion and analysis that resulted through this platform. Living with this artefact
and reflecting on their life memories with the deceased from within a very personal
context will be a huge challenge for individual participants.

Since the experience of continuing bonds with the deceased is a very private
and psychological experience, there is a limitation to using quantitative methods.
Moreover, regarding the literature review, it is no accident that most the studies
related to grief and bereavement used qualitative research. Therefore, I used
semi-structured in-depth interviews as the qualitative method for validation. I
undertook these with a small number of participants because, for this topic, it
was important to see how people could dive deeply into this product rather than
how many people could use this product. In this manner, I was able to observe
how they created continuing bonds and made meaning out of their lives through

the experience with the product.

4.2. Period & Procedure of the Long-Term Study

According to Maltz's book "Psycho-Cybernetics" (Maltz 2002) and the study by Phillippa Lally (Clear 2014), it is suggested that a minimum of approximately 21 days and an average of 60 days are needed for an old mental image and habit to be replaced by a new one. Building upon the insights gained from 'Section 3.5 Short-Term Experience' with participants *A* and *D*, participant *A* engaged with the artefact only three times within a span of two weeks due to her busy schedule and other commitments. On the other hand, participant *D* utilized the artefact intensively for five days following the assignment, establishing a strong bond.

Considering the potential stress of daily contemplation of the deceased for participants and the risk of extended evaluation leading to boredom, a four-week period was deemed appropriate for long-term validation. Based on advice from psychiatrist Yoshida Atsushi and considerations for the participants' daily routines, the recommendation for using the artefact was four times a week for 5 to 15 minutes per session. However, flexibility was maintained, especially regarding the frequency of use to prevent any potential feelings of depression, particularly after the initial week of interviews.

The period of finishing the four-week study varied for each participant, yet it ended around May 2023 on average. Participants had the flexibility to use *Be.side* at their convenience to maintain continuing bonds with the deceased. I set a period until the end of September 2023 to observe whether participants proactively used the artefact even without my prompting, and to understand when they wanted to maintain continuing bonds with the deceased. Here, the aim was to gain insights into their usage patterns and engagement even in the absence of any external prompts by myself as researcher.

The reason for selecting September was based on the fact that 'Obon day', a day to honour ancestors, is observed in August in Japan and in September in South Korea (the Korean word is Chu-seok). Given this cultural context and the traditional mourning practices, such as 'Jae-sa' in South Korea and 'Butsdan (Buddhist altar)' in Japan, (as mentioned in the previous literature), I chose

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September to observe how participants reacted and engaged with *Be.side* alongside these traditional mourning customs.

The procedure of the long-term study was articulated as follows:

1) I provided a preliminary questionnaire to participants to gather information about the relationship between themselves and the deceased person.

2) Three or four meetings featuring semi-structured interviews were conducted with participants to explore answers to preliminary questionnaires and build relationships.

3) Based on insights from interviews, I provided a palette of alternative scents and sounds linked to the deceased person and finalised them with each participant. The speed of the heartbeat and brightness of *Be.side* were also adjusted to individual preferences.

4) *Be.side* was delivered to participants together with the instruction manual and the dedicated Question book.

5) For a period of 4-weeks, participants were asked to live with the artefact and to engage with it 3-4 times a week by simply turning on the switch which activated the multi-sensory elements. Participants could use the Question book to support remembrance.

6) Semi-structured interviews were conducted weekly with all participants during the study.

7) After the end of the long-term study participants were free to retain *Be.side*.

The detailed method and actions of the long-term study process are outlined in the following Figure 4.1.

4.3. Ethical Consideration

This research was approved by Keio University Graduate School of Media Design ethics committees. All participants were explained the purpose of this research and signed consent forms prior to beginning the long-term study. Participants were explained that their personal details and other identifiable information would not be disclosed, but I recorded voices during interviews for transcription and analysis
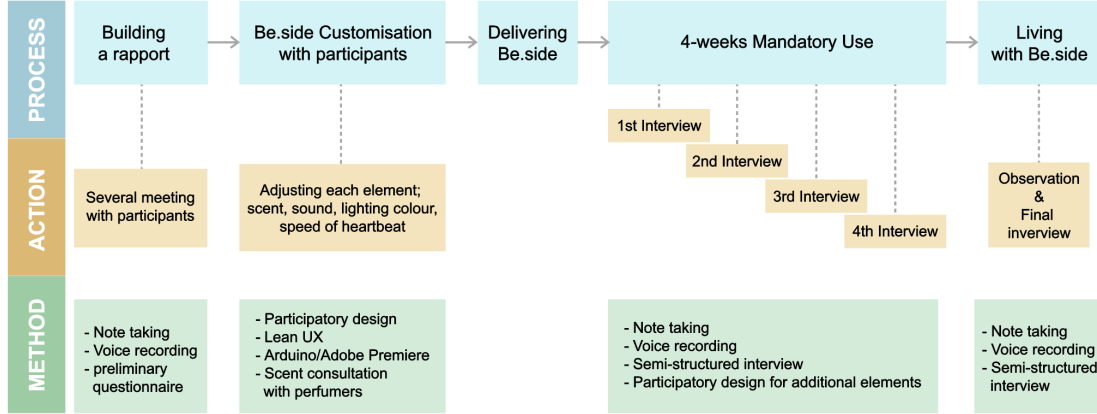
Figure 4.1   4-week Long-term Process and Methods

as all participants had agreed. Details are below:

Truth Value: In order to achieve a truth value, rapport building between a researcher and participants is a very important factor in actively participating in the interview. In this regard, a key consideration in my study was building a relationship of trust between me and participants ensuring an environment where participants could feel comfortable to express their emotions, thoughts and any concerns they might have. Hence, prior to initiating the long-term study, I provided a comprehensive explanation about my research experience in this field since my Master's degree, and emphasised the significance of research. In addition, to establish credibility, I openly shared my personal stories of losing a family member, highlighting my genuine empathy and deep understanding of the participants' emotions and experiences.

Reliability: Clinical data utilizing technology in the context of continuing bonds, particularly concerning grief, is currently lacking. Moreover, this topic is a sensitive and emotional one for each person. Therefore, to verify the safety of *Be.side* and minimise the possibility of generating negative experiences, the final prototype was reviewed by three experts, two psychiatrists - Su-geun Im and Yoshida Atsushi from South Korea and Japan - and Professor Minagawa in a psychology department at Keio University, Japan. They confirmed that *Be.side* was

an immersive artefact and is unlikely to evoke negative emotions. They stated that *Be.side* offered an abstract way to help bereaved participants in recollecting memories of the deceased, affirming its safety for long-term deployment.

Rigorousness: As mentioned above, the safety of *Be.side* was verified by experts from Psychology and Psychiatry, as well as being approved by Keio University's ethical committee. Nevertheless, throughout the long-term study each interview, I checked the participants' emotional responses, asking whether they felt comfortable to continue the study or they wanted to withdraw.

4.4. Data Collection & Analysis

The concept of the researcher's reflexivity holds significant importance in qualitative research because the researcher's personal backgrounds, identities and beliefs inherently influence the way the researcher conducts research, develops research inquiries, and interprets gathered data (Stepanova et al. 2022).

When conducting coding, I utilised Inductive Thematic Analysis (ITA), allowing participants' statements obtained from In Vivo coding to be extracted without reflecting my subjectivity. However, in Reflective Thematic Analysis(RTA), my interpretations were influenced by my background as a South Korean, considering cultural nuances and beliefs as well as the choice of methods, which were all reflected in my analysis. For example, the interviews conducted over four weeks were conducted in participants' native language, Korean, except for the Japanese participant *Yui* who could speak Korean fluently, yet who was potentially more comfortable expressing emotions in her native language. Hence, she provided responses in Korean during the interview, while later I requested to summarise and write down her emotions in Japanese. After that, I translated the transcript to see how accurately it compared against my Korean interview content. To ensure transparency in my research and acknowledge the biases stemming from my background, I started to write down reflexively at first, elucidating how my previous experiences and expertise influenced my research and analysis. The next section contains more detail of the process of analysis.

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4.4.1 Interview Transcription

Each participant interview was conducted in a semi-structured manner and carried out orally in Korean by myself, a native Korean speaker. Although *Yui* could speak Korean fluently, her native language was Japanese. Therefore, her interview was basically conducted in Korean. After the interview, I requested her to send written notes in Japanese to supplementation prior content so that she could express her feelings more completely. Using the mother-tongue was chosen to support participants in articulating their experiences in a manner that felt most comfortable and appropriate to them (Elhami and Khoshnevisan 2022). Every interview was audio recorded, and I also took notes as appropriate. Audio recordings were manually transcribed in Korean first and then manually translated into English. After transcription, I repeatedly read each participant's contents until they were fully familiar. Then, I followed an 'Thematic Analysis' using both inductive and reflective approaches (Braun and Clarke 2006) (see more details in 3.2.6 Thematic Analysis in Methodology).

4.4.2 Coding, Category and Themes

Firstly, I created In Vivo coding, which is "directly using the language and terminology" employed by the participants, capturing their perspectives and meanings. Subsequently, I extracted important and meaningful words and sentences from each participant (Figure 4.2, 4.3, 4.4 on page 120 to 122).

In order to interpret, I prepared basic descriptive questions such as:

- What experiences are being described? Any similar and dissimilar?

- Did they continue bonds with the deceased? How did they continue?

- How did the artefact contribute to their continuing bonds with the deceased?

- What is the difference between multi-modal design and existing design?

- Which literature offers the most compelling support for the results of participant interviews?

Then, I found that there were commonalities in what they expressed. For example, all participants used *Be.side* before going to sleep whether that was due to the lighting or the experience of concentration in a calm state. Although there were differences in the procedures each participant followed, they all had a conscious approach. This can be found in **Min's In Vivo,** *"a religious feeling, I'm having a gate"*, **Yui's In Vivo,** *"drinking barley tea made me much more calm and relaxed, recapping"*, and **Nara's In Vivo,** *"put my ear on, therapeutic, at night, after having a shower, religious meaning or ritual"*. Furthermore, regarding the heartbeat stimulation, they all felt a sense of stability and comfort, as seen in **Min's In Vivo,** *"The heartbeat is very strong, reminds me childhood memory that I was lying on my grandfather's tummy"*, **Yui's In Vivo,** *"heartbeat made me calm and relaxed"*, and **Nara's In Vivo,** *"A bit depressed and missed my father, heartbeat, comfort, pillow"*. However, their preferred elements varied.

During the early stages of the long-term study, they also mentioned feelings of regret, especially when using the Question book to have a conversation with the deceased. **Min's In Vivo,** *"when I answered the question 'If there is something you haven't said yet, please tell the deceased grandfather', I felt sad, if he was alive, he would definitely be proud of me"*, **Yui's In Vivo,** *"Cannot sleep, regret, couldn't spend much time with him"*, and **Nara's In Vivo,** *"I could talk with him in my heart, the memory of my adolescence that I ignored him, thank you and sorry"* illustrate these feelings of regret.

In the final interview, all three participants experienced changes in emotions and attitudes while maintaining continuing bonds. Such changes are recorded below: **Min's In Vivo,** *"Family albums, talked with my mother about past memories, talked about late grandfather with father, can be a touch-point to talk about the deceased"*, **Yui's In Vivo,** *"I could confront my reality, using the artefact was autonomy, I tried to recollect good memories of him, strong grief became 'healthy and good' grief"*, and **Nara's In Vivo,** *"When I get old, I could understand my father, an opportunity to re-think and to re-understand about him"*. Then, these commonalities were grouped to create categories (Figure 4.5 from page 123 to 124).

These could be categorised as follows:

- Ritual of using *Be.side*

- Start of Creating Continuing bonds

- Impact and Goal of Elements

- Regret

- Changing Attitudes and Thoughts throughout Living with *Be.side*

- Empathy and Expressing

- Cultural difference

- Result of Maintaining Continuing bonds

As codes and categories were defined, I formulated the final interpretation of the themes. After several refinements of themes, I finalised five themes (Figure 4.9).

The category of 'Ritual of using *Be.side*' was refined into the theme of **"Personalised Rituals and Personalised Bonds"**, and the category of 'Impact / Role of elements' was refined into the theme of **"Evolving Multi-sensory Difference"**. I grouped the categories of 'Start of creating continuing bonds' and 'Empathy and expressing' as **"More than just an artefact"**. The categories of 'Changing attitudes and thoughts throughout living with *Be.side*', 'Regret' and 'Result of maintaining continuing bonds' are grouped into the theme of **"Pros and Cons in Continuing Bonds"**. The name of the theme **"Cultural difference"** remained the same.

These themes go on to form each sub-title within Chapter 5. Discussion, where I describe what I have interpreted through the above Inductive and Reflective Thematic Analysis.

In vivo codes	Text
	Q: First impression
The heartbeat is very strong, it reminds me of my childhood memory when I was lying on my grandfather's tummy	A: "I was very surprised. The heartbeat was very strong for me. It reminds me of my childhood memory of lying on my grandfather's tummy."
Combining the smell of medicine and the sound of NHK news were strongly reminiscent	A: "I closed my eyes during the experience. The combined smell of medicine and sounds of NHK news were strongly reminiscent of my grandfather's room. It was also interesting that all the elements were replicated from my interview."
	Q: When did you use the artefact? How are you keeping this artefact?
Before going to bed	A: " Before going to bed. My religion is Catholicism, thus I always pray to St. Mary before going to bed. But now, I use this artifact first, then pray to St. Mary and go to bed." "Next to St. Mary."
	Q: Use of Question book
I was strongly immersed in the atmosphere of the artefact	A: "I didn't use the question book this week, actually I forgot. I was strongly immersed in the atmosphere of the artefact."
	Q: The most effective element to evoke the deceased
The combination of each element is very powerful, the heartbeat was especially strong, this slow beat with translucent lighting made me calm and meditative	A: "I cannot mention just one thing. I think the combination of each element is very powerful. The heartbeat was especially strong. It doesn't evoke my late grandfather directly, but this slow beat with translucent lighting made me calm and meditative, and these peaceful emotions made me reflect on my childhood memories with my late grandfather."
	Q: feedback of one week use (continuing bonds with the deceased during a week)
Since the initial interview, I'm often thinking of my late grandfather	A: "Since the initial interview, I'm often thinking of my late grandfather. It makes me recollect the memories of him."
	Q: Impact of each element
When I recollected the memories of my late grandfather, I missed him and sorrow was coming out, the role of the heartbeat is holding (suppressing) the grief	A: "I still like the heartbeat stimuli. I felt like I'm meditating due to the heartbeat stimuli and it made me calm and comforted. In terms of sound, I can listen to the baseball stadium shouts of NHK news that made me recall the Sunday daily life. My grandfather often watched the baseball game on Sunday. In terms of smell, this strong smell of medicine was spreading into the room. When I recollected the memories of my late grandfather, I missed him and sorrow was coming out. I think the role of the heartbeat is holding (suppressing) the grief. I could feel that."
	Q: Changing your thoughts and life
I like the interview every week because I can freely talk about my late grandfather, my family members were unwilling to hear his stories	A: "I like the interview every week because I can freely talk about my late grandfather. I always wanted to talk about him, but people, including my family members, were unwilling to hear his stories. We usually avoid talking about a dead person although the dead person was our loved one."
	Q: How do you feel during two weeks
The questions led me to talk to my late grandfather, especially when I answered the question "If there is something you haven't said yet, please tell the deceased grandfather", I felt sad, if he was alive, he would definitely have been proud of me	A: "I could focus on this artefact with the different stimulation of the senses, and naturally engaged in retrospection on my late grandfather. But, from the third week, I thought "what's next?" I got used to the sound and smell, so I used the question book. The questions led me to talk to my late grandfather. I felt quite awkward saying something to the artefact, but I tried. I kept concentrating on the atmosphere again, especially, when I answered the question "If there is something you haven't said yet, please tell the deceased grandfather", I felt sad. I accomplished many things such as a degree and a job after my grandfather passed away. If he was alive, he would definitely have been proud of me. I wished to share this happiness with him."
I thought of my late grandmother as well, the sound of the chopping board of grandmother's cooking, I had never looked back on these memories, the artefact made me reflect on my past memories spontaneously	A: "During the second time of use in this week, I thought of my late grandmother as well. My grandfather always had a breakfast which was western style, such as a bread with omelet, ham and salad. I always got up with the sound of the chopping board of grandmother's cooking. She cooked his breakfast every morning, moreover, she cooked rice and soup for other family members. I had never looked back on these memories, the experience through this artefact made me reflect on my past memories spontaneously and find the memories that I've forgotten."
	Q: How were the new elements compared to the old elements (delivering additional elements)
The new sound and scent, they elicited other new emotions and memories, this artefact is truly bespoke, this could symbolise my late grandfather.	A: "Even though I couldn't understand NHK news, I had almost memorised it, so changing to a new element was great. When I listened and smelled the new sound and scent, they elicited other new emotions and memories. I could recollect that my late grandfather's foreign friends visited Korea, and they stayed at our house. This artefact is truly bespoke, I could say that this could symbolise my late grandfather."
reminisced with closed eyes, recapped on my daily life, quite liked this procedure	A: "I answered the questions from the book, and reminisced with closed eyes. I think I got used to the questions, I wasn't sad that much, it seems like I recapped on my daily life, like writing a diary. I quite liked this procedure."
	Q: Changing your thought and life after continuing bonds
Before, I could only describe the last moment of my late grandfather which is a sad moment, I could vividly imagine the moment although there was no visual element, touching and comforting	A: "When you asked me about the memories of my late grandfather, it was very expansive, that is why before the long-term study, I could only describe the last moment of my late grandfather which is a sad moment. But this artefact led me to recollect the memories of my late grandparents and my childhood. Each element may facilitate each sense, thus I could vividly imagine the moment although there was no visual element. (I always closed my eyes during the experience.) At the end, the touching and comforting emotion endured."
A one-sided conversation, I prayed for my family's wellbeing, a religious feeling, I have a "gate", family albums, talked with my mother about past memories, talked about late grandfather with father, can be a touch-point to talk about the deceased	A: "I can have a one-sided conversation with him now, I prayed for my family's wellbeing to my late grandfather last night. It seems to have been sublimated into a religious feeling. Also, I felt like I have a "gate" where I can go in when I miss my late grandfather. This is also one of the comforting elements I felt. During the long-term experience, I took out family albums, talked with my mother about past memories. When my father came into my room, he was curious about this artefact, thus, I explained to him about this experiment, and we talked about my late grandfather. Usually, we don't casually talk about him. This artefact can be a touch-point to talk about the deceased."

Figure 4.2 Min's In Vivo Codes

In vivo codes	Text
	Q: First impression
My father came into my dream, cannot sleep, regret, the stimulus of the heartbeat caused a great sensation, a new experience that I've never tried before	A: "My father came into my dream! I suddenly think of my late father before go to sleep and the grief often comes out. Sometimes, I cannot sleep. Most of my feeling is regret such as 'I wish I could spend more time with my father' etc.' When I used this product for the first time, the stimulus of the heartbeat caused me a great sensation. This is a new experience that I've never tried before. I hope this experience can make me think of my father in a good way."
	Q: When do you use / Impact of each element
The song of "Yomiuri Giant" made me vividly recall my childhood memories, the heartbeat made me calm and relaxed,the scent of barley tea was weak, drinking barley tea made me much more calm and relaxed, recapping the day, still sad, helped me not to think about other things such as regret, sorrow, trying to recollect the happy moments	A: "The cheering song of "Yomiuri Giant" made me vividly recall my childhood memories of my late father. The heartbeat made me calm and relaxed. The scent of barley tea is weak, thus I used this artefact while drinking barley tea, this made me much more calm and relaxed. It feels like recapping the day. I'm still sad when I think of my late father, but this whole experience including sound, smell, haptic stimulation and the taste of tea helped me not to think about other things such as regret, sorrow etc. I've been trying to recollect the happy moments with my deceased father."
	Q: Where do you keep
On the bedside table, used this sitting down on the bed, I always evoke my late father before going to bed, naturally, aesthetically	A: "I keep this artefact on the bedside table, and I use this sitting down on the bed. Sitting down on the bed is the most comfortable position, and I always evoke my late father before going to bed, thus I can use this naturally. That is why I keep this beside the bed. Additionally, I like this shape and size aesthetically."
	Q: How do you feel
Less sad than last week, I tried to recollect the happy and funny memories of my late father, I will visit his favourite ramen restaurant	A: "Last week was very sad, but this week was less sad than last week. I tried to recollect the happy and funny memories with my late father. One of the evocations of his memory is that he loved ramen. Normally the soup of ramen is very salty, but he always drank it all. I'm going back to Japan next week. I will visit his favourite ramen restaurant."
Reading this question book, I was very sad, it felt hard, a one-sided conversation, liberated, freely talked to him	A: "When I read this question book, I was very sad, it honestly felt hard. However, the more I used it and tried to have a one-sided conversation with my late father, I felt "liberated". I could freely talk to him and cried. I want to give this book to my sister, could you make me another one?"
	Q: How do you use
Became a ritual, absorbing stimulus of each sense, recollecting	A: "I think this became a ritual : before going to bed -> brewing barley tea and switch on the product -> drinking tea and smelling -> relaxed -> using the product -> absorbing the stimulus of each sense - > recollecting the deceased father's memories."
	Q: Impact of each element
Sound is very powerful, I'm familiar with the Buddhist alter, I wish to insert my father's photo, showing a photo is familiar to me, 5 mins setting is fitting, not to be depressed	A: "For me, sound is very powerful. Personally, I wish to stick my father's photo into the artefact. I'm familiar with the Buddhist alter, we have my father's one in the house in Japan. For this reason, showing a photo is familiar to me. 5 mins of using this product is the only time I face with my father. You've mentioned that I can extend the 5 mins more and more, but the 5 mins setting is fitting in that I can strongly immerse myself in the atmosphere, not get depressed and easily come back to reality. But the touching is long- lasting."
	Q: Regarding visiting Japan, continuing bonds with the late father
Took out my album, talked to my sister about my father, recollect good memories, an opportunity to think of my father in a good way	A: "I went back to Japan myself, my husband had to work. I took out my album in my home, and talked to my sister about my father. We still cannot talk in front of my mother. But, I shared my sister that I'm participated in this research. I gave the question book, she was about to cry. We went to the ramen restaurant that I've mentioned last interview. We talked about father again." "After participating this research, I often recollect good memories with my late father in daily life. This experiment gave me an opportunity to think of my father as a good way. If I didn't participate, I would still be sad. Thank you for this opportunity."
	Q: Regarding upgraded product
Seeing this artefact, I can vividly think of my father, leave a flower, change it	A: "I really like the current product which has my father's photo. When I see this artefact, I can vividly think of my father. I leave a flower next to the artefact, and change it when it withers."
	Q: Why do you choose this photo
Old photos, feel emotional	A: "I prefer old photos rather than recent ones. The photo I gave you is my favourite photo. He looks happy. When I look at him in the photo, it makes me feel emotional, I don't know why."
	Q: Effective elements from the artefact
Sound has a strong impact on me, currently living in Korea, Yomiuri Giant's song makes me feel nostalgic, repeated heartbeat made me serene, a photo could symbolise my father	A: "I cannot specify that only one element is effective. As I mentioned, sound has a strong impact on me and the recall of my childhood memories, and the repeated heartbeat made me serene. I'm currently living in Korea not Japan, the sound of "Yomiuri Giant's cheer song" makes me feel nostalgic. I can imagine my old house, the street, the scene of my father who is lying down and watching the baseball game on Sunday. Combining a photo could symbolise my father."
	Q: Changing your thought and life after continuing bonds
I could confront myself with my reality, using the artefact autonomously, I tried to recollect good memories of him, strong grief became 'healthy and good' grief	A: "My feeling of loss was ongoing and I didn't know how to cope with my emotions and to continue my life although it's been a year since my father left. I couldn't accept the reality of father's death, therefore, I avoided thinking of him. I was fortunate to meet you and I could confront myself with my reality. I wasn't conscious of participating in your research. I used the artefact autonomously. When I missed him, I used this artefact. I tried to recollect good memories of him. I still have grief. Yet, strong grief became 'healthy and good' grief."
Talking to you and sharing our personal stories is a valuable part, therapeutic, I could express grief	A: "I also identified that talking to you and sharing our personal stories is a valuable part. It was therapeutic that someone was understanding my feelings, I could express grief, this experience led me to accept my father's death and to form a relationship with my late father. Now, when I look at this artefact, I can think of my father. I will keep using this artefact when I feel sad and miss my father."

Figure 4.3 Yui's In Vivo Codes

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In vivo codes	Text
	Q: First Impression / effective element
This research product is easy to use, the smell didn't work so well this time, I could focus on other elements, the harmony, emotional and meditative	A: "Compared with the initial prototype, this research product is easy to use. The speed of the slow heartbeat made me immerse myself in this experience and feel calm and comforted. In the initial experiment, I could vividly evoke my late father, especially the scent of Aramis worked well. To be honest, the element of smell didn't work so well this time. It was powerful at first, I could focus on other elements later on. I think the harmony of scent, sound and the heartbeat led me to be emotional and meditative."
I lay down on a desk, put my ear close, therapeutic	"A: "I lay down on a desk and put my ear close to this artefact. It occurred to me "Does the fetus in the mother's womb feel like this?" I felt the heartbeat and song while lying down for quite a long time. It was therapeutic, and I thought about my father.""
	Q: Where do you keep
On the shelf of the bookcase in my room, well made without noise, I wanted to sit down at my desk to concentrate on it	A: "I'm keeping this product on the shelf of the bookcase in my room. During the short-term experiment, I kept the initial prototype on a dressing table, and I smelled it while putting on makeup. The initial prototype was unstable (sound of noise), thus its role was to do with the lighting and the diffuser. Yet, this research product is well made without noise, thus I wanted to sit down at my desk to concentrate on it."
	Q: How do you use / feel
I sometimes forget the anniversary of his death, the question book reminded me that it's been a long time since we talked, Your research led me to remember the past emotions; good and bad, I think this is a continuing bond, writing a diary, a one-sided conversation, I could talk with him in my heart, the memory of my adolescence when I ignored him, `thank you and sorry'	A: "My father passed away more than 10 years ago, and I got used to being without him. I sometimes forget the anniversary of his death, and recently I missed my father's birthday. When I read the question book, it reminded me that it's been a long time since we talked. Especially the question of "Any concern?" I wanted to talk about my marriage with him. I wanted to introduce my partner to him and suddenly I became sad. I realised again that I had lost my father. Your research led me to remember past emotions; good and bad. I think this is a continuing bond. I answered each question, "how was your day today?" it seems I'm writing a diary. It made me reflect on my recent life. Although I had a one-sided conversation with my late father, I liked the way that I could talk with him in my heart. Two days ago, I used this again for a second time. The question of "if there's something you haven't said yet, please tell the deceased." elicited diverse emotion and thinking; the memory of my adolescence when I ignored him etc. I said `thank you and sorry'."
	Q: Effective element
I still like the heartbeat stimulus, keeps me calm and comforted with the translucent lighting, richer experience	A: "I still like the heartbeat stimulus.The heartbeat keeps me calm and comforted with the translucent lighting. But the other elements contributing to this experience are richer."
	Q: Changing life, thought
My mind has been changed in a good way, he passed away in his 50s, still young, we avoided thinking of him, wanted to preserve memory but they became hazy, facilitated recollection of the memories of him	A: "My mind has been changed in a good way. My family still don't talk about my late father. He didn't die in old age, he passed away in his 50s which is still young. This part made us sad, and we avoided thinking of him. But, after participating in your research, I reminisce about the memories of him and I don't avoid them anymore. Some memories I wanted to preserve but they became hazy. This experience may facilitate my recollection of the memories of him."
	Q: When do you use
A bit depressed, and missed my father, heartbeat, comfort, pillow	A: "I wanted to use this artefact because I was a bit depressed and missed my father. I could identify that the heartbeat gave me comfort. If the size is bigger, I can use it like a pillow."
When I feel tough and need sympathy, his letter, talisman, mother does not take out his picture at home, his letter is inside the artefact	A: "I find this artefact when I feel tough and need sympathy. When my father was alive, he often gave me a letter. Some letters are lost. I only have the letter that he sent me when I was a middle school student. This letter is my talisman. All his stuff was burnt and mother didn't take out his picture at home. I read his letter when I feel tough. But, now I'm using this artefact, and I put his letter inside the artefact."
	Q: Changing your feeling, thought
When I get older, I could understand my father, an opportunity to re-think and to re-understand him	A: "Now I'm thinking about my father and childhood. When he passed away, I was in my 20s. The values and ways of thinking have changed, especially as I get older, I could understand my father. He worked hard and took responsibility for us. This artefact gave me an opportunity to re-think and to re-understand my late father."
	Q: How do you use
this week was tough, crying	A: "This week was tough. When I talked to him based on the questions, I wished he could be beside me and it made me sad again and I cried. I was surprised that I still cry. I think I was too immersed."
I use this artefact at night, after having a shower, religious meaning or ritual, new memory which I had never thought about	A: "I use this artefact at night, after having showered and preparing to go to sleep. I don't have a religion, but this experience has a kind of religious meaning or ritual. I recollected a new memory which I had never thought about before such as the episode of Sunday morning, his favourite foods etc. I talked about him with my partner. My partner's father also passed away, thus we shared the memories of our fathers. I felt that I got much closer to my partner."
A one-sided conversation, grumbling, feel liberated, I wished he could answer me, a good advisor	A: "I had some trouble with my co-worker. I used this for conversation with my late father. My mother doesn't have any work experience. Thus, she cannot understand my feeling. Even though it was a one-sided conversation, grumbling to my late father about the co-worker made me feel liberated. At the same time, I wished he could answer me. If he was alive, I could talk and drink with him, he would be a good advisor. I realised again that he died so early."
	Q: Do you want the artifact to communicate with you? How would you feel if the artifact could talk to you in the deceased's voice?
	A: "I don't want it. If this artefact tells me something with his voice, it would be very creepy. The media industry is now using AI for replicating a dead person, I don't like it. This is not real. Thus, I don't want my father to be replaced by something. That is why I'm participating in your project. If you used AI or something, I wouldn't join your project."
	Q: Effective element
a great comfort to me through all of the senses, combination, bittersweet	A: "This has been a great comfort to me through all of the senses. The combination of smell, sound, lighting and haptic sense works positively. But, I feel bittersweet."
	Q: Changing your life /thought
All his belongings are burnt and we don't have a grave, can be a symbol of him, still have tears, I kept thinking "what if~", I also liked to talk with you during the interview, I could talk freely about my late father and express my feelings, more helpful for the people who recently lost their loved one	A: "Putting his letter inside led me to equate this product with my father. All his belongings were burnt and we don't have a grave. This artefact can be a symbol of him, I can say that I'm able to find this artefact when I miss him or when I need him. It was a good opportunity to talk and re-think about him. I could look back on my past. But I was surprised that I still have tears. Recollecting my father's memories was good, but also the grief came out. I kept thinking "what if he were alive, what if he were beside me", that made me feel depressed. I had trouble with my co-worker, this was helpful in a therapeutic way. I also liked to talk with you during the interview. I could talk freely about my late father and express my feelings. I think this artefact is much more helpful for people who have recently lost their loved ones. As we have experienced, the bereaved are struggling with grief up to one or two years."

Figure 4.4 Nara's In Vivo Codes

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Category	In vivo codes of each participant
Ritual of using *Be.side*	Before going to bed, next to St. Mary
	reminisced with closed eyes, recap on my daily life, quite liked this procedure
	A one-sided conversation, I prayed for my family's wellbeing, a religious feeling, I have a "gate"
	On the bedside table, used this sitting down on the bed, I always evoke my late father before go to bed, naturally, aesthetically
	Scent of barley tea is weak, drinking barley tea made me much more calm and relaxed, recapping the day
	I lay down on my desk, put my ear close, therapeutic
	On the shelf of the bookcase in my room, well made without noise, I wanted to sit down at my desk to concentrate on it
	I use this artefact at night, after having a shower, religious meaning or ritual, new memory which I had never thought about
Start of creating continuing bonds	Since the initial interview, I'm often thinking of my late grandfather
	My father came into my dream
Impact / Role of elements	The heartbeat is very strong, reminds me of the childhood memory when I was lying on my grandfather's tummy
	The combination of each element is very powerful, the heartbeat was especially strong, this slow beat with translucent lighting made me calm and meditative
	When I recollected the memories of my late grandfather, I missed him and sorrow was coming out, the role of the heartbeat was holding (suppressing) the grief
	Combining the smell of medicine and the sound of NHK news were strongly evocative
	The stimulus of the heartbeat caused a great sensation in me, a new experience that I've never tried before
	The heartbeat made me calm and relaxed
	Became a ritual, immersed in the stimulus of each sense, recollecting
	This research product is easy to use, the smell didn't work so well this time, I could focus on other elements, the harmony, emotions and the meditative
	I still like the heartbeat stimulus, it keeps me calm and comforted with the translucent lighting, richer experience
	A bit depressed and missed my father, heartbeat, comfort, pillow
	A great comfort to me through all of the senses, combination, bittersweet
Regret	The questions led me to talk to my late grandfather, especially, when I answered the question "If there is something you haven't said yet, please tell the deceased grandfather", I felt sad, if he were alive, he would definitely be proud of me
	Cannot sleep, regret, couldn't spend much time with him
	I could talk with him in my heart, the memory of my adolescence when I ignored him, `thank you and sorry'

Category	In vivo codes of each participant
Changing attitudes and thoughts throughout living with *Be.side*	The new sound and scent, they elicited other new emotions and memories, this artefact is truly bespoke, this could symbolise my late grandfather
	I was strongly immersed in the atmosphere of the artefact
	Still sad, helped me not to think about other things such as regret, sorrow, trying to recollect the happy moments
	Less sad than last week, I tried to recollect the happy and funny memories of my late father, I will visit his favourite ramen restaurant
	Sound is very powerful, 5 mins setting is fitting, not to be depressed
	Took out my album, talked to my sister about my father, recollected good memories, an opportunity to think of my father in a good way
	Seeing this artefact, I can vividly think of my father
	Sound has a strong impact on me, currently living in Korea, Yomiuri Giant's song makes me feel nostalgic, repeated heartbeat made me serene, a photo could symbolise my father
	I sometimes forget the anniversary of his death, the question book reminded me that it's been a long time since we talked, Your research led me to remember the past emotions; good and bad. I think this is a continuing bond, writing a diary, a one-sided conversation
	My mind has been changed in a good way, he passed away in his 50s, still young, we avoided thinking of him, wanted to preserve my memories but they became hazy, facilitates the recollection of the memories of him
	this week was tough, crying, still have tears, I kept thinking "what if~"
	A one-sided conversation, grumbling, feel liberated, I hoped he could answer me, a good advisor
Empathy and Expressing	I like the interview every week because I can freely talk about my late grandfather, my family members were unwilling to hear his stories
	Reading this question book, I was very sad, it felt hard, a one-sided conversation, liberated, freely talked to him
	Talking to you and sharing our personal stories is the valuable part, therapeutic, I could express grief
	I also liked to talk with you during the interview, I could talk freely about my late father and express my feelings
Cultural difference	I'm familiar with the Buddhist alter, I wish to insert my father's photo, showing a photo is familiar to me
	I leave a flower next to the artefact, and change it when it withers
	All his belongings are burnt and we don't have a grave, could be a symbol of him
	When I feel tough and need sympathy, his letter, talisman, mother doesn't take out his picture at home, his letter inside the artefact
Result of maintaining continuing bonds	I thought of my late grandmother as well, the sound of the chopping board of grandmother's cooking, I had never looked back on these memories, the artefact made me reflect on my past memories spontaneously
	Before, I could only describe the last moment of my late grandfather which is a sad moment, I could vividly imagine the moment although there was no visual element, touching and comforting
	Family albums, talked with my mother about past memories, talked about my late grandfather with father, can be a touch-point to talk about the deceased
	I could confront myself with my reality, using the artefact autonomously, I tried to recollect good memories of him, strong grief became 'healthy and good' grief
	When I got older, I could understand my father, an opportunity to re-think and to re-understand him
	More helpful for people who lost their loved one less than one or two years ago

Figure 4.5 Category of Each Participant's In Vivo

Theme 1	Theme 2	Theme 3	Theme 4	Theme 5
Personalised Rituals and Personalised Bonds	**More than just an artefact**	**Pros and Cons in Continuing Bonds**	**Evolving Multi-sensory Difference**	**Cultural difference**
Category				
Ritual of using Be.side	*Start of creating continuing bonds*	*Changing attitudes and thoughts throughout living with Be.side*	*Impact / Role of elements*	*Cultural difference*
	Empathy and Expressing	*Regret*		
		Result of maintaining continuing bonds		

Figure 4.6 Final Theme

4.5. Findings

4.5.1 Different experiences of grief

Several initial meetings (three or four times) were conducted in semi-structured in-depth interviews. These, resembled natural conversations for rapport building at the same time, allowing the collection of rich and deep description. Each interview took about an hour on average.

Preliminary questions with participant's responses are below:

- How long has it been since he/she passed away?

- What reason did he/she pass away? (illness, accident etc)

- How was your relationship with the deceased?

- How do you feel when you think of the deceased?

- Is there any medium that can evoke the memory of the deceased?

Throughout the initial meetings and the interviews carried out during the study, it became clear that participant's personal stories and grief influenced their desire to feel connected to the deceased person.

Min had a close and meaningful relationship with his late grandfather, who served as a significant role model in his life. He lived with grandparents together in the rural areas of South Korea, where Min's childhood was filled with the beauty of nature rather than a city. He noted that he has fond memories of bonding with his grandfather through outdoor activities and mountain hikes.

He deeply admired his late grandfather. The grandfather had played a vital role as a pharmacist during the Korean War and continued his studies in a pharmacy in Sweden afterwards. Thus, inspired by his late grandfather, *Min* had also decided to study overseas. Unfortunately, while *Min* was studying in Europe, he received the heartbreaking news of his grandfather's passing. He mentioned that one of the most significant regrets in his life was not being able to be with his grandfather during his last moments.

A poignant and painful memory haunted *Min*'s family regarding his grandfather's last days. *Min*'s father had told him that the grandfather was developing dementia. When *Min*'s father had asked the grandfather if he would consider moving to a nursing home as they could not look after him anymore, the grandfather refused to respond, and he passed away a month after that conversation. *Min*'s father regretted the conversation afterwards and often stated *"He left fast because I told him about the nursing home"*. While *Min* shared this story with us, he was overwhelmed by sadness.

His family has a memorial service called Jae-sa (introduced in Chapter 2), for the deceased grandfather on the anniversary of his death which is a traditional ritual in South Korea. Yet *Min* felt that this was become a formal ritual over time. He wanted a more intimate and personal connection with his late grandfather.

"My grandfather sometimes comes up in my mind, then I take out his photos. I talk with my mother regarding my late grandfather sometime, but my father doesn't want to talk about him." – Min (P1)

Yui had experienced a recent loss, and her grief for her late father was more prominent even though she accepted the reality of his death. During the initial meeting, she shared some very personal stories. When she graduated the university in Japan, her parents were divorced. However, she was already grown up and felt no resentment for the divorce nor did it affect her negatively, thus she maintained a close and harmonious relationship with both of her parents. Despite the fact that she couldn't see her father often due to the divorce, the connection between father and daughter remained strong, and they shared a special bond.

Her husband was South Korean, they met at work. Her life took a turn when she met and married her South Korean husband. They made plans to move from Japan to South Korea for business opportunities. Unfortunately, during this time, her father's health had already begun to decline and he was diagnosed with cancer. Shortly after their relocation to South Korea, *Yui* received a phone call that delivered distressing news about her father's worsening condition. She rushed back to Japan to be by his side, but her father passed away a few days later.

"My father didn't want me to live other country, he worried about me. I think he was waiting for me before he passed away" – Yui (P2)

In addition, although her parents were divorced, her mother also experienced strong grief following the loss and *Yui* felt worried about her. In her mother's house in Japan, the Buddhist altar of her late father is there, she mentioned.

"I accepted my father passed away, but sometimes create an illusion myself that if I go back to Japan, my father would be there." – Yui (P2)

Overall, *Yui* felt guilty for not being able to nurse her father and spend much time with him as she was living in South Korea at the time. Especially, she couldn't sleep at night because she thought about her late father. She wanted to maintain continuing bonds in a positive way and this drove her to participate in our research.

Nara had a closer relationship with her late father compared to her mother. Her father passed away when she was in her early 20s, while she studied in Japan. Her mother didn't tell her that her father was sick because she was concerned. Her mother's decision made her upset while she was overseas. When she heard about her father's imminent death, it came as a sudden shock. She had been able to process the death over time, yet she remembered how she suffered at that time. She mentioned that she had expressed a lot of resentment towards her mother for not informing her about her father's illness, and she stayed away from South Korea for a while after her father's passing. Now she felt sorry for his death more than missing his presence. She mentioned that she could understand him better when she became older, in her 30s.

"His life was quite short, he only focused on his responsibility as a father and a husband for our family" – Nara (P3)

She mentioned that her family didn't keep any of his belongings at home since he passed away: they had all been burnt through traditional rituals. *Nara*'s father often went on business trips and he would write letters to her from the airplane. Only some photos and letters from him remained, but she didn't often look at them. However, she noted that a letter from him or a scent of cosmetics that her father used or even a celebrity on TV who looked like her father evoked the memory of her late father. She wanted a more consistent and subtle way to remember him.

4.5.2 Engaging in Continuing Bonds

After I had built a rapport and customised *Be.side* for each participant, the three participants lived with these artefacts for four weeks. During this period, I interviewed them to understand how they created and maintained continuing bonds with the deceased.

Basic questions for the semi-structured interview are below:

- When do you use this product?

- Where did you keep this product?

- In terms of sound, smell and haptic stimuli, what are the most effective elements that evoke the deceased?

- How has your life has been changed after continuing bonds with the deceased through this product?

After living with *Be.side*, all participants reported using *Be.side* in the evenings before going to bed. **Min** traditionally had a ritual of praying to the Holy Mary before going to bed. Since starting the study, he began to keep *Be.side* next to the image of the Holy Mary on his bedside table (see Figure 4.10 on the next page), using it to feel connected to his grandfather before praying and going to sleep.

Yui also kept *Be.side* on her bedside table, and used it while sitting down on the bed (see Figure 4.10 on the previous page). In the initial meeting, she explained how she often struggled to sleep well due to thoughts of her late father. She noted how she frequently evoked memories of her late father before going to bed, and found it natural to use *Be.side* to explore those memories more actively, which motivated her decision to keep the artefact beside the bed. Additionally, she mentioned that she found the shape and size of *Be.side* aesthetically pleasing and she was not concerned about other people seeing it there. **Nara** kept *Be.side* on a shelf of the bookcase in her room and used it sitting at her desk before going to bed (see Figure 4.10 on the previous page). The interesting point was that she put a letter that she had received from her late father when she was in middle school underneath the *Elastomer* cover.

Participants found that living with *Be.side* and engaging with it every day had a gradual effect on their thoughts and emotions which evolved over time. **Min**'s first impression was of a *"surprising and new experience"*. He noted that he closed his eyes when activating the artefact and that the combined smell of medicine and sound of NHK news were strongly reminiscent of his grandfather's room, and the heartbeat stimuli made him recall the memory of laying his head on his grandfather's stomach when he was a child. In the second interview, *Min* used the Question book as a guide to express his feelings and memories. He didn't feel

Figure 4.7 Photos of Keeping *Be.side* by each participant

the need to use the book in the first week, because he could focus on the artefact alone and naturally reminisce about his grandfather. However, after using *Be.side* several times, he got used to its multi-sensory stimuli and decided to open the Question book. Some questions of the book led him to want to talk to his grandfather. He felt quite awkward about the idea of speaking to an artefact at first, but he tried to concentrate on the atmosphere and simply talk to his grandfather.

"When I answered the question 'if there is something you haven't been able to say yet, please tell your deceased grandfather.', I felt sad. I accomplished many things after grandfather passed away. If he was alive, he would definitely be proud of me. So I said that"–Min (P1)

Engaging with *Be.side* regularly, made it easier for him to keep the memory of his grandfather in his mind. Sometimes he shared memories with his mother which further helped him to maintain continuing bonds in his life. His routine of going to bed changed from that point. He first prayed to his late grandfather for his family's well-being and then prayed to the Holy Mary.

The day of her first interview after the start of the study **Yui** told us that she had had a dream about her late father the previous night. Her first impression of *Be.side* was positive and she felt curious to use it more. However, *Yui* found the scent of barley tea too weak, therefore she decided to use the artefact while drinking barley tea, which made her feel calmer and more relaxed as she thought back about her day and listened to the sounds and vibration from *Be.side*. She noted that the first week of thinking about her father made her feel very sad, but during the second week the sadness seemed to be less pronounced. She tried to recollect happy and funny memories with her late father from her childhood and the music and smell from the artefact helped her. She told us laughing that one of the memories she had of her father was that he would always drink all the soup when having Ramen. As Ramen soup can be remarkably salty, she often teased him for it.

During the long-term study, *Yui* visited Japan for four days. Although she did not bring *Be.side* with her, the memories that she recalled helped her keep

a continuing bond with her late father when she travelled back to Japan. At her old house, she took out an old family album and talked to her sister about their father. Together they visited his favourite ramen restaurant which she had mentioned to us in the previous interview. She also prayed everyday in front of his Buddhist altar in her mother's house. In the last interview, *Yui* expressed her gratitude to us for having given her the opportunity to process her grief about her father and recall happy memories from her childhood.

Nara had a strong desire to engage with *Be.side* from the very beginning. On her first day she recalled using the prototype for 15 minutes in a row, activating the trigger three times.

"I lied down on a desk and put my ear to this artefact. It occurred to me that "Does the fetus in the mother's womb feel like this?" I immersed the heartbeat and song in a lying position quite a long time. It was therapeutic, and I thought about my father's memories."–Nara (P3)

She used the artefact to share her daily concerns or when she wanted to be comforted. For example, after having some troubles with her co-worker one day, she used *Be.side* to grumble to her late father about the argument. At the same time, she felt sad that he could not be there to listen to her in person. As she engaged in maintaining continuing bonds with her father, she felt somehow bittersweet especially on the day of the third interview which was the day after *Parents day* in South Korea. Recently her brother's family had a baby and they gathered in the family home where her mother lives. She thought about her late father and felt that if he had been alive, he would have been happy about having a grandchild, and she felt a longing for her late father. When she used some of the prompts from the Question book around the date of *Parents day*, she wished that her father could be beside her which made her sad and caused her to cry.

This shows how, depending on individual situations, the same question could lead to very different feelings. Concerned about her well-being, I suggested that she might want to limit or avoid engaging with the *Be.side* for the following week if it caused her grief to become more intense. However, in her final interview she

explained that she had kept engaging with the artefact to maintain continuing bonds with her father and she had been able to share with her partner some memories of him. She mentioned that before the start of the study she had rarely thought about her father but she had also forgotten the feeling of loss and sadness. The study had been a good opportunity for her to evoke memories of her late father, at the same time, the experience felt bittersweet.

4.5.3 Evolving Continuing Bonds through the Multi-sensory

Throughout every interview, participants told me of new vivid memories that were evoked and that they had never recalled before the long-term study. The sensory element that participants found most effective was different from person to person, and tended to change over time.

Min described his experience during the first week as almost meditative. The combination of various sensory elements provided him a sense of calm and comfort. When he listened to cheers from the baseball stadium from the NHK news broadcast through *Be.side*, it made him recall the Sundays of that time in his life. He noted that when he was recollecting memories of his late grandfather, he felt a sense of grief. However, the heartbeat stimuli helped him to alleviate these sad feelings. Each element seemed to trigger multiple senses, thus he mentioned that he could vividly imagine specific moments even though *Be.side* had no visual element. Even after the experience, the sense of connection and comfort remained.

Yui couldn't define one element as being more effective at the first interview. She liked the harmony of each element. As she was currently living in South Korea and not Japan, the sound of the "Yomiuri Giant's cheer song" brought a wave of nostalgia. She could vividly imagine her old house, the street and the scene of her father lying down to watch baseball games on Sundays. The smell of barley tea in the *Be.side* was relatively weak as I expected, thus she drank the barley tea when using the artefact.

"I'm still sad when I think of my late father, but this whole experience including sound, smell, haptic stimulation and taste of tea leads me to focus on this atmo-

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sphere, and not to dwell on other things such as regret or sorrow"–Yui (P2)

Nara is the participant who actively engaged in every phase of my research, starting from the interviews to the experiment for the development of prototypes, and finally the short-term experience. She could recognise the improvement of *Be.side* and how her feedback had been applied.

In the first interview, she mentioned that compared to the initial prototype, this final version was more user-friendly with one single switch, and the noise from the internal components no longer disrupted her experience. She could immerse herself in the atmosphere. She liked the combination of various elements and felt a general sense of calm and comfort. However, her overall experience was influenced by her emotional state.

4.5.4 Additional Requirement, and Iterative Development

In the third interview with **Min**, he mentioned that he used *Be.side* an average of three times a week and his continuing bonds with his late grandfather had deepened over time. He shared the story of his grandfather always having had a western style brunch in the morning. He thought this might be due to his grandfather's studies in Sweden. The typical Korean breakfast is rice, soup and side dishes, however, Min's late grandmother always prepared special breakfasts for his grandfather, consisting of bread or pancakes, fried eggs, vegetables and sausages every morning. He recalled that during his childhood, he used to wake up to the sound of his grandmother chopping ingredients on a cutting board and the smell of freshly baked bread. He specifically requested additional scent and sound to be added to the *Be.side* experience. Therefore, the sound was obtained from a royalty-free sound platform: regarding the smell of bread, I used the scent I developed during my Master's project, a collaboration with a perfumer in London (More details in *4.5. A Bespoke Be.side via Participatory Design*).

Yui made two additional request after the end of the second interview. One was to create a copy of the Question book for her sister, and the other was to attach her late father's photo on the artefact. She sent me a photo of her late father and herself when she was a baby. I asked her why she had chosen this specific photo.

She mentioned that firstly, she preferred old photos rather than recent ones as old photos were more nostalgic. Secondly, this photo was her favourite because her father looked so happy hugging her, and when she looked at this photo, she felt connected to him. Again I explained my concept through which the deceased could be evoked, using an olfactory, auditory and haptic experience to maintain continuing bonds. I further mentioned that the photo would not be directly attached to the product but, would be seamlessly integrated into the design and would create a more abstract atmosphere, and *Yui* agreed to this. She expressed anticipation for a new *Be.side*, and mentioned that if she had wanted the photo attached directly, she would have done it herself. After a week, I delivered the second Question book and the upgraded *Be.side*(More details in *4.5. A Bespoke Be.side via Participatory Design*) before she went to Japan for a family visit. She was very satisfied the new *Be.side* which included her late father's photo and said that it helped her to vividly think of her late father.

Nara didn't request any additional elements. She experienced again the feeling of loss and depression related to her father's absence. This happened due to personal family issues as well as some trouble at work, so I let her take a break for a week for her well-being. However, I discovered that she customised *Be.side* by herself. She placed the letters that her late father had sent her throughout her life inside the *Be.side*.

4.5.5 *Be.side* as a New Channel

The four-week study with three participants typically concluded around May 2023. The participants had the flexibility to continue using *Be.side* at their convenience, and to maintain continuing bonds with the deceased until the end of September, over a span of eight months. This period included "Obon day", a day dedicated to honoring ancestors, observed in August in Japan and in September in South Korea, where it is known as Chu-seok.

When I asked about when they used *Be.side*, all participants mentioned that they used it when they missed or thought of the deceased. They all mentioned that they felt like they had found a "channel" to connect with the deceased when they missed the deceased, and they liked the idea of having their personal ritual

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to mourn the deceased. Over the four months, *Min* used *Be.side* a total of nine times. He mentioned that whenever he needed comfort or couldn't sleep at night, he would turn to the artefact, finding comfort in the heartbeat, lighting, and soothing sounds as well as thoughts about his late grandfather he prayed to him asking that everything would be fine. *Yui* mentioned that she used the artefact approximately 15 times. She sometimes just turned *Be.side* on to look at her father's photo. She noted that having *Be.side* made her feel closer to him. In the case of *Nara*, who experienced the sense of bittersweet during the four-week study, she used *Be.side* three times over the four months. When I asked if she had thought of her late father three times in four months, she mentioned that even when she couldn't recall her late father's memories without *Be.side*, looking at *Be.side* brought back those memories. However, she actually only used it three times. One of the uses of *Be.side* was during Chu-seok: a day to honour ancestors. She explained that Chu-seok reminded her of her late father, prompting her to use the artefact.

In summary, while the participants did not intentionally use *Be.side* as frequently as during the four-week study, they found it to be a valuable channel for maintaining their continuing bonds with the deceased. *Be.side* provided them with a way to connect with the deceased whenever they felt the need to do so. In particular, while **Nara** didn't use *Be.side* as often, she recalled her late father when she looked at the *Be.side*. This result shows that *Be.side* definitely plays a role of continuing bonds. The decision to maintain these continuing bonds or not is up to the bereaved individuals.

4.6. Summary

I proved the concept through a four-week long-term study of the intensive use of *Be.side*. Before the four-week long-term study, rapport building was essential between me and participants: it fostered trust and led to participants' willingness to be part of the *Be.side* long-term study. Therefore, participants and I customised the scent and sound of each participant's memory, adjusting the speed of the heartbeat to their most comfortable pace and applying it to *Be.side* via a participatory design approach.

Be.side was a channel between the bereaved participants and their deceased loved ones. Participants evoked memories of their deceased through three core elements of *Be.side*. They gradually interacted with *Be.side*, recalled new memories that they hadn't thought of before, and requested additional elements from me. Bearing in mind the "iterative", one of the characteristics of participatory design, and considering the personal topic, I allowed participants to require continuous feedback and personal requests. Therefore, *Yui* requested to attach a photo of her late father in the *Be.side*, while *Min* requested another scent and sound through one of his childhood's memories. This circumstance can be identified as one of the results of continuing bonds. As such, participatory design methods were utilised not only in setting up *Be.side* before the long-term study but also in accepting bereaved individuals' requests and developing *Be.side* during the long-term study.

The interviews were conducted each week over the four weeks with each participant, every interview was audio recorded, and I had a transcript of each interview in Korean first, then translated into English. I utilised In-vivo coding to extract important sentences and words from the answers, and categorised the commonalities of the answers of three participants. I applied Reflective Thematic Analysis, which resulted in the identification of five themes: 'Personalised Rituals and Personalised Bonds'; 'Evolving Multi-sensory Difference'; 'More than just an artefact'; 'Pros and Cons in Continuing Bonds'; 'Cultural difference'. These factors were described in Findings, and will be further described in Chapter 5 in conjunction with my subjective interpretation.

The study ended around May 2023, though participants freely used *Be.side* until September. This time frame covers "Obon day" in Japan(Aug) and "Chu-seok" in South Korea(Sept), both dedicated to honouring ancestors. While participants did not use *Be.side* as frequently as during the long-term study, they still found it valuable for maintaining bonds. *Be.side* was a channel to connect with the deceased when the bereaved missed their deceased. The decision to maintain these continuing bonds or not was up to the bereaved individuals, but this result shows that *Be.side* definitely has a role in continuing bonds.

Chapter 5

Discussion

5.1. Personalised Rituals and Personalised Bonds

Throughout the long-term study, I observed that all participants developed specific rituals for when and how they interacted with *Be.side*. They commonly used the device in the evening before going to bed due to the gentle lighting to help them remember their deceased loved ones before sleep.

Min, who originally had a religious background, incorporated the use of *Be.side* into his religious practices. For example, after creating continuing bonds with his late grandfather through *Be.side*, he started to pray to his grandfather to seek the well-being of his family and his happiness, then he prayed to St. Mary. I was concerned that *Yui*'s *Be.side* smell of barley tea would be too weak, so I gave her barley tea together with the artefact at the start of the study. Unintentionally, this led to her forming her own ritual of engaging with *Be.side*. She used the artefact after she had a shower and before going to bed, she steeped her tea and recalled her late father's memory when as she waited for it to be ready. *Nara* felt that using *Be.side* helped her to wrap up her day with memories of her late father before going to bed. All participants gradually found ways to integrate their use of *Be.side* as part of their own daily rituals, which facilitated the process of maintaining their continuing bonds with the deceased.

Prior works have explored rituals in death and mourning. For instance, *Fenestra*(Uriu and Odom 2016) randomly showed digital pictures of a deceased person by flickering candlelight, which encouraged the bereaved to focus on the interaction with the object, suggesting a new way of mourning the deceased when compared to a traditional Buddhist altar, common in Japan. By contrast, Sas et al's research explored the therapeutic value of rituals as disposal practices (Sas et al. 2016). Interestingly, Sas's disposal practices were similar to traditional Ko-

rean rituals in bereavement. As I introduced in the literature review, when a person dies, family members burn the deceased's belongings; clothes, shoes etc in South Korea (Soo-hyun et al. 2013). However, *Min* and *Nara* who are both South Korean mentioned that they felt sorry that they did not have any of their loved one's belongings as a result of this traditional ritual. In addition, according to the initial two rounds of interviews, the young generation in Japan and South Korea wanted to mourn their deceased loved ones in their own ways rather than following traditional rituals of past generations.

Many HCI researchers have used digital remains such as metadata, photos, location and heart rate data to create 'Thanatosensitive' objects for remembrance and bereavement support, yet little work has focused on the creation of objects that are not based on digital remains (Moncur et al. 2015)(Wallace et al. 2020)(Jørgensen and Jenkins 2023)(Eriksson and Hansen 2017)(Häkkilä et al. 2019)(Uriu and Odom 2016)(Getty et al. 2011). In this regard, *Be.side* represents a meaningful example of manifesting intangible memories as tangible objects through a participatory approach. The process of exploring and adjusting specific scents and sounds from their childhood memories gave participants the opportunity to engage in continuing bonds.

In addition, it could be argued that *Be.side* offers a new way to privately mourn the deceased. Although its context is somehow similar to *Fenestra* (Uriu and Odom 2016), the difference lies in the fact that *Be.side* is intended as a personal way of creating continuing bonds, which is different from the goal of memorialisation of an altar or a monument.

In the last interview, three participants noted that while they were happy to share the memories triggered by *Be.side* with their family members, they did not want to share the artefact with them because key memories of the deceased would be different for each person, thus the elements of the artefact should be different. This suggests that future designs of artefacts that focus on fostering continuing bonds should aim to incorporate features that support the creation of personalised rituals which can be meaningful to specific individuals based on their own preferences, beliefs, and their relationships with the deceased person. If the artefact is intended for long-term use, it is also important to consider how the relationships and rituals that people create might change over time. For

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instance, accommodating additional elements based on participants' requests or, as in *Nara*'s case, the inclusion of her father's letters inside the prototype, is one such aspect to consider.

To summarise, depending on the causes of and reasons for how the bereaved lost the deceased, some wish to maintain continuing bonds, thus they follow their traditional or own rituals. However, for others, disposal practices can be helpful to move on from the death of the deceased towards the next steps in their lives. I believe the important thing is the sense of comfort these rituals bring to the bereaved. Ultimately, in this research project, three participants created their own rituals with *Be.side*, they followed the process of the ritual for continuing bonds.

5.2. More than Just an Artefact

All three participants noted that their process of continuing bonds with the deceased started from the initial interview before they actually received *Be.side* and started to engage with it. Furthermore, they appreciated the four interviews because they had opportunities to freely talk about the memories of the deceased, and to share their feelings of loss and grief. This is a similar finding to the one expressed by a participant in the *Storyshell* study (Moncur et al. 2015) which highlights how not only the interaction with the artefact but the creation of a safe space for the bereaved participants to express their feelings and feel listened to by the researcher is crucial in the context of design for bereavement.

Min and *Nara* had lost their loved ones quite a long time ago, so this long-term study gave them an opportunity to recall the deceased from the initial meeting. They described recollecting new memories in every interview, and gradually created continuing bonds. Furthermore, during the initial meetings, participants provided broad and vague descriptions of their memories of the deceased, with a particular focus on the last (sad) memories. However, as they continued to live with *Be.side* and engaged in interviews with me, they gradually recalled more vivid and cherished childhood memories. In contrast, *Yui* had lost her father a year ago, thus when I met her the first time, she said that she often thought about him and was still sad. Her late father's memories were vivid, yet I wanted to help

her engage with them more positively. During the four-week study and beyond, she tried to focus on happier memories of her father through *Be.side.* Moreover, she mentioned that she felt a sense of kinship with me because we talked about how her father had passed away as a result of the same disease that had affected my late father.

Throughout the research, I found that it was crucial to deeply engage with bereavement theory and evidence from grief care. This means recognising the importance of allowing the bereaved participants to openly express their feelings and to have their stories listened to, and ensuring that I continuously adjusted my approach to meet their needs, rather than assuming they would conform to a fixed research schedule. This is also one of the methods used when treating bereaved patients, as mentioned in interviews with psychiatrist Yoshida Atsushi and Im Su-guen.

5.3. Pros and Cons in Continuing Bonds

Recalling memories of a deceased person was a bittersweet experience that incorporated delight, longing and sorrow. Although individual participants had favourite sensory elements, combining all of them allowed them to deeply engage in remembrance. It was interesting to note how all of them mentioned that they could feel a sense of calm and comfort related to meditation when using *Be.side.* My interpretation is that the consistent rhythmic nature of the heartbeat stimuli might have helped them remain focused on the present moment and not be overwhelmed by the feeling of grief, particularly considering how the combination of other elements created such an immersive atmosphere.

Interacting with *Be.side* allowed them to preserve their memories of the deceased and to maintain their continuing bonds with them. However, this engagement had both positive and negative connotations. *Min* and *Yui* enjoyed being able to reconnect with their loved ones and were grateful for the opportunities of remembrance that *Be.side* created, but to *Nara* reminiscing caused a resurgence of grief. Throughout the weekly interviews *Nara*, often spoke about her regret. One of the most common sentences she used when talking about her father was *"what if..."*. Maintaining continuing bonds involves engaging with our memories

of a deceased person, but not all the memories that we evoke are positive ones. *Min* and *Yui* also spoke about sad memories which brought a sense of longing, but they were able to accept them and move forward, whereas for *Nara* this didn't necessarily happen.

My goal was not to create a perfect 'solution' to relieve grief and longing through continuing bonds. Instead, I aimed to provide this nascent design and observe how continuing bonds can be maintained through *Be.side*, which served as a channel between the deceased and the bereaved for future exploration. Looking at this through the lens of Continuing Bonds Theory (Field et al. 2003), the possible reasons for *Nara*'s reactions lies in the pre-death relationship with her father. As her mother did not share news of her father's sickness while she was studying abroad, his death came as a sudden shock. She did not have time to prepare herself to let him go. Although in her final interview she stated that the grief had lessened and her feelings were more positive, the relatively short time of the study makes it challenging to understand if the experience of engaging with *Be.side* to connect with the memories of her father had been beneficial to her.

Through examining the differential impact of *Be.side* on participants, one potential idea is that this artefact could be an option to integrate with the field of 'Thanatosensitive' objects and bereavement therapy (Wakenshaw 2020). This approach could be exploited to leverage the strengths of artefacts such as *Be.side* that can be used to engage in remembrance and conversation, enabling the development of a new relationship with the deceased. At the same time, the support offered by a therapeutic process can help individuals to process their feelings of grief which might be evoked by the use of these objects.

5.4. New Channel for Continuing Bonds

All participants' first impression was "Surprising and new experience". Initially, the participants paid attention to the heartbeat stimuli when first using *Be.side*. This seemed to be the reason why that while smelling scents or listening to sounds are easily encountered in daily life, experiencing the sensation of a heartbeat stimulus is uncommon. However, as they gradually used *Be.side*, they began to focus on the overall atmosphere created by the combination of each element.

When asked about their "favourite element", *Yui* mentioned "sound", but also emphasised that the combination of all elements was what she liked the most. *Min* mentioned that the heartbeat stimulation seemed to mitigate grief when it arose. *Nara* initially experienced a strong reminiscence through the scent of *Aramis* lotion during the prototype experiment in phase 1, but she concentrated on the combination of each element during the long-term study. These multi-sensory elements contributed to evoking diverse memories among the participants.

Be.side concentrates on evoking the memories and recollections of the deceased within the minds and thoughts of the bereaved family members. Therefore, direct elements such as replicating the actual face of the deceased or the texture of their skin were excluded. Instead, the focus was placed on abstract elements like scents and sounds that could evoke memories of the deceased, allowing individuals to reminisce about the deceased. Of course, the reproduction of scents and sounds doesn't perfectly match the memories of the deceased held by the bereaved family members. However, the process of seeking scents and sounds that could represent the deceased, while not identical, was unique. In that process, the recreated scents and sounds were sufficient to evoke thoughts of the deceased. Moreover, this is evident from an interview with Jong-woo Kim, a producer of "Meeting you". The producer Kim explained about the audiences' negative reactions of awkward virtual space and Na-yeon's artificial appearance such as mismatched lip-syncing with spoken dialogue. The bag Na-yeon carried, the doll and foods in the virtual space, were not just randomly created but were assembled from several in-depth interviews with Na-yeon's mother about things Na-yeon liked. He noted that these items might not seem sophisticated enough for immersion in the virtual space from a third-party perspective, yet these items might have been special to Na-yeon's mother, leading to emotional engagement.

Considering these aspects, even though the representative scent and sound of the deceased do not completely match the original ones of the deceased, *Be.side* can be seen as a new channel to preserve the memories of the deceased and to interact with them through the multi-sensory. An additional channel beyond photographs for when the bereaved miss the deceased, *Be.side* facilitates the evocation of tranquility through heartbeat, promotes meditation and triggers scents and sounds reminiscent of childhood memories. This development significantly

indicates the impact of *Be.side* within the framework of 'Thanatosensitive' objects and potential bereavement therapy (Wakenshaw 2020). *Be.side* could help in fostering a new relationship with the deceased, encouraging remembrance and conversation. Combining the interaction with the artefact *Be.side* with therapeutic support could help individuals to process their grief.

5.5. Broader Implications via Participatory Design

I designed the framework and components of *Be.side* myself during "Phase 1: Basic Framework Design". In "Phase 2: Participatory Design", I collaborated with three participants. While the basic framework of *Be.side* provided content including scents, sounds, heartbeat stimuli and lighting remained the same, the elements were refined in collaboration with each participant. As participatory design aims to empower end-users by ensuring that it meets their needs and preferences, the process is often iterative, I allowed participants to request continuous feedback and make additional requests during the long-term study if needed. *Yui* requested to attach a photo of her late father in the *Be.side*, while participant *Min* requested another scent and sound relating to one of his childhood memories. The requirement of attaching *Yui*'s photo of her late father was an unanticipated request as my concept was to focus on the senses of smell, hearing and touch, excluding an extremely visual impact. Considering the goals of participatory design and personal artifacts, I enhanced the *Be.side* by incorporating a subtly flickering illumination synchronized with heartbeat stimuli, featuring a photo of her late father. *Yui* expressed satisfaction with this improved product.

This situation helped me to learn the value of participatory design. *Be.side* is a channel for beloved departed individuals, thus the basic framework was not enough for them. Therefore, throughout the participatory design process, even though *Be.side* was not very much changed (i.e. *Nara* didn't request any additional element but just put her late father's letter inside the *Be.side*), this process gave participants a sense of ownership of the artefact, and they cultivated strong bonds with the deceased.

The decision to create *Be.side* with simple configurability and personalisation capabilities was a significant factor in making the research manageable. While

similar to the *StoryShell* device (see Figure 2.7 in 2.1.5 Continuing Bonds in Context of Design) that was using participatory design, *Be.side* introduced layers of multi-sensory awareness and iterative development, offering significant potential value. This highlights the power of participatory design as a method for developing prototypes that involve delicate handling of sensitive subjects and demand interaction between artefacts and users. However, it is probably impractical or unfeasible for me to offer customised elements for participants to possess and utilise indefinitely. While the participatory design process led to notable personalised interventions, there is a requirement to broaden this discussion to formulate more efficient strategies to delicately address potential concerns related to research products and prototypes in the future.

5.6. Cultural Difference

South Korean participants *Min* and *Nara* mentioned during the first meeting that they had followed the traditional ritual of mourning by burning their deceased loved one's belongings (Kyung-taek 2003). In addition, their families had been reluctant about possessing the deceased's belongings due to the shamanistic culture in South Korea (Mills 2007, Bok-gyu 2013). *Min* and *Nara* seemed to share the common belief that having the deceased person's belongings was not desirable, although they expressed a sense of regret about not having these belongings. I found that they were more accepting of *Be.side* which offered a new way to mourn their deceased loved ones through scents and sounds that they had selected, and because *Be.side* was not one of their deceased's belongings.

In comparison, *Yui*, brought her late father's belongings to South Korea and placed *Be.side* on the bedside table with flowers and her father's Buddhist prayer beads (Figure 4.10). She noted that she hadn't placed flowers on the bedside table before, yet when she was living with *Be.side*, she changed the flowers when they withered away, which is similar to maintaining a Buddhist altar. Similarly, during a short-term experience interview with participant *D,* he noted that the content of *Be.side* - the sound of a bell and the scent of incense - was similar to a Buddhist altar. However, he mentioned the difference is that the scent and sound of *Be.side* were decided from memories of the deceased.

This aspect seems to show the cultural differences between South Korea and Japan, with Japanese culture valuing the deceased's belongings and imbuing meaning into these objects. Therefore, while Korean participants simply placed *Be.side* in a location close to themselves, the Japanese participant managed *Be.side* with a sense of honouring the deceased. I believe that this is the reason why *Yui* wanted to put her late father's photo into the *Be.side.*

Chapter 6

Conclusion

This PhD research explored how the bereaved create and maintain continuing bonds with the deceased loved ones in the context of design, and how these design experiences affect the bereaved's emotions and lives. The finalised artefact called *Be.side* is a bespoke multi-modal artefact that helps the bereaved individuals maintain continuing bonds with the deceased loved ones by leveraging meaningful memories.

Results from a 4-week long-term study and more showed how participants were able to elicit continuing bonds with the deceased loved ones not only through their engagement with the artefact but also as a result of engaging with the research process more generally, which included repeated interviews, participatory design of multi-sensory elements including scents, sounds and heartbeat stimuli. In particular, the design and adjustment of these bespoke elements could be leveraged to symbolise the deceased person in a unique way that helped the bereaved person reconnect to the person they had lost, sometimes by evoking their childhood memories. This bespoke artefact was not only customised at the beginning but could also be adapted during the long-term study. This aspect represents the uniqueness of my research compared to other studies on the topic of continuing bonds. I focused on observation and analysis of the participants' long-term involvement, I believe this helps to evaluate the notion of supporting continuing bonds.

To summarise, bereaved participants evoked memories of the deceased through the multi-sensory experience provided by *Be.side*. Over time, they gradually developed personalised rituals associated with using the artefact. The bereaved participants continued bonds with the deceased supported by the research process. In particular, weekly interviews served as a platform for emotional expression and, talking about the deceased, accompanied by increasing empathy between participants and myself. The participatory design process gave participants a sense

of ownership of *Be.side*. They cultivated strong bonds with the deceased, and various effects were observed, such as participants' sense of comfort while at the same time, effects included the eliciting of bittersweet emotions in the bereaved individuals. Nevertheless, they were able to maintain continuing bonds, noting that they gained a better understanding of their deceased loved ones, for example, they took out some photo albums or talked with family members about the deceased (Figure 6.1).
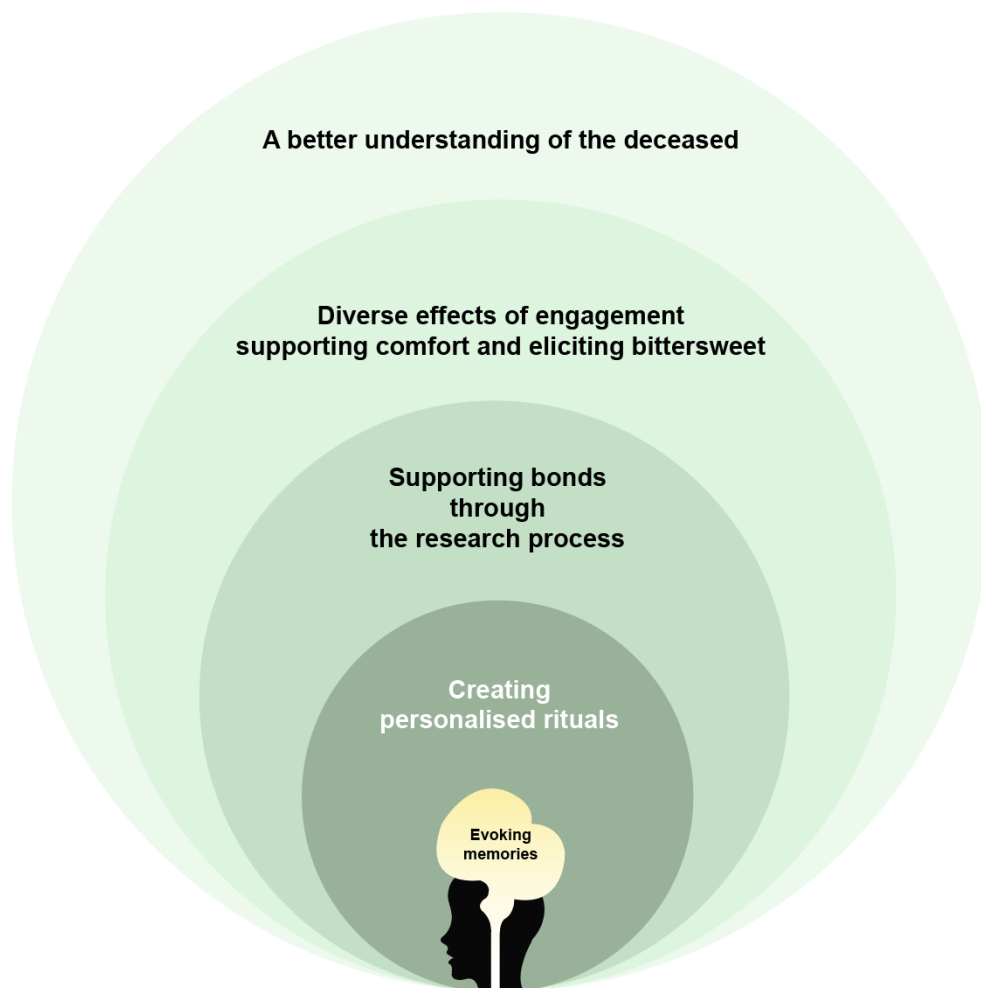

Figure 6.1 The Process and Changes in Maintaining Continuing Bonds among the Bereaved Participants

My findings in relation to the central research questions (see Chapter 1) are:

[RQ1] What is the value of continuing bonds?

Continuing bonds signify a natural phenomenon by which bereaved individuals maintain a connection with their deceased loved ones. The value of continuing bonds is evident in contemporary studies on bereavement, where they are recognised as a valuable approach to addressing feelings of loss and grief.

Previous bereavement theories, such as those of Freud, Kübler-Ross (1969), or Rando (1983), emphasised detachment from the deceased, presenting 'staged' or 'phased' models to illustrate coping mechanisms following a loss. However, contemporary bereavement theories acknowledge the complicated and diverse nature of grief, considering individual, interpersonal and societal elements that influence the mourning process, adaptation and the creation of meaning after the death of a loved one. In this regard, continuing bonds have a significant impact on fostering an enduring connection between the bereaved individuals and the deceased. Continuing bonds allow the bereaved to maintain attachment, memories, and an emotional link with the departed, honouring their relationship and shared memories. These bonds offer comfort and aid in the process of grief and healing. However, the bereaved individuals sometimes avoid continuing bonds with the deceased due to the triggering of grief-related emotions. To address this, my focus was on exploring ways to maintain continuing bonds affirmatively and to encourage the bereaved to accept their emotions.

[RQ2] How can the multi-modal artefact help the bereaved in maintaining continuing bonds with the deceased?

I observed three participants using *Be.side* for approximately eight months to explore the role of this artefact in maintaining continuing bonds. The elements of the artefact including sound, scent, the speed of the heartbeat and translucent lighting were created and adjusted with each participant through their memories of the deceased. These elements helped partici-

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pants vividly recall memories of the deceased, which in turn, fostered the continuing bonds.

During the four-week long-term study, participants felt calm in the comforting atmosphere, and they reflected on their lives. Specific scents and sounds prompted participants to reminisce about memories of their deceased, thereby continuing their bonds. Participant *Min* requested additional scents and sounds, while *Yui* asked to incorporate a photo of the late father. After the long-term study finished, this artefact was not frequently used, yet it served as a "channel" for participants to meet their deceased loved ones whenever they felt the need, remembered them, or during commemorative events like "Obon day" or "Chu-seok", which honours ancestors. In addition, before the four-week long-term study, rapport building was essential between me and participants, fostering closeness and trust, which played a pivotal role in my research. It is important to note that the creation of continuing bonds goes beyond the use of the artefact. It involves expressing grief, talking about the deceased, and customising the elements of *Be.side*. The entire research process contributed to the creation and maintenance of continuing bonds with the deceased.

[RQ3] If the bereaved proactively reflect on the deceased in their lives, how does it affect the bereaved?

Through my research, I have observed that bereaved participants who maintain continuing bonds with the deceased loved ones, facilitated not only by the *Be.side* artefact but also through the process of interviews and co-creating elements, experience a strengthening of their connections with the deceased. This results lead to a sense of improved well-being as they express their feelings of loss and engage in conversations about the deceased. Participants created their own rituals to connect with the deceased in diverse ways. These rituals helped them maintain continuing bonds with the deceased, bringing the deceased closer to their lives. When they missed the deceased, had thoughts of them, or felt concerned, they would practice their personal *Be.side* rituals to connect with the deceased, which brought them

a sense of calm and comfort, sometimes even leading to tears.

It is important to note that, based on the 4-week long-term study, one participant described their experience of maintaining continuing bonds as bittersweet. This suggests that continuing bonds can evoke both positive and negative memories, contingent upon the individual's unique pre-death relationship with the deceased. Nevertheless, it is crucial to acknowledge that the negative memories are also an integral part of the deceased individual's life story. Accepting this reality and developing a new, positive relationship with the deceased are essential steps for each bereaved individual.

Furthermore, this observation highlighted cultural differences between South Korea and Japan. South Korean participants were more focused on their experience with *Be.side*, given the traditional ritual of burning the deceased's belongings in South Korea. On the other hand, Japan has a long-standing cultural tradition of attributing meaning to 'objects' and preserving the deceased's soul through Buddhist altars. In this regard, the Japanese participant thought more about the surroundings of *Be.side* (e.g. flowers) in her efforts to maintain bonds. She was not only focused on *Be.side* experience, but also decorated it like a Buddhist altar, changing the flowers next to *Be.side* when they withered away.

In terms of original contributions to knowledge, I believe that my research contributes on diverse levels. Firstly, most of the related works incorporated visual elements, and the multi-sensory such as smell, sound and touch to evoke the deceased, however, this integration of elements was derived entirely though a process of participatory design. This can provide unique and valuable contributions to the fields of design, HCI, and continuing bonds studies. Secondly, *Be.side* was reviewed by three experts from South Korea and Japan. They confirmed that it is an immersive artefact and an abstract way to help participants in recollecting memories of the deceased, affirming its safety for long-term deployment. Thirdly, this research can serve as a good case study of the use of technology and design for sensitive topics. Further, there is a lack of design studies about continuing bonds: designing an artefact related to continuing bonds in bereavement can

make a valuable contribution. The limiting of the participants to South Koreans and Japanese, and observation of the distinct individual, social, and cultural perspectives contributes on another level. Reflecting on their rituals and attitudes towards death and mourning plus, shown in each participant's way of keeping the artefact provides a unique example of research in the field of bereavement studies. However, with only three participants, I cannot generalise about cultural differences. Due to the sensitive nature of the topic and the diverse situations regarding grief and bereavement, I focused on engaging with a smaller number of specific participants and worked collaboratively with them. While this approach represents a strength of my research, it also presents a limitation.

For future studies, firstly, one of my further steps is to enhance basic components of the artefact. During the user study, there was feedback that users would like the artefact to feel warm. I attempted to incorporate temperature, but it seemed like the size would have to increase, so I didn't apply it to the final research product. Instead, I used colours to create a warm image. Moreover, *Yui*'s refined product enriched the basic *Be.side*. Therefore, in addition to the current three core elements, I would like to proceed by adding this element so that users can attach an image symbolising the deceased. It would not necessarily be a photo of the face; if the deceased liked cars, the image would be a car. Secondly, this research can be expanded into various forms of bereavement. In this PhD study, I focused on three adults who lost their adult parents or grandparents. However, there are different forms of bereavement such as the loss of a parent by a young child, the loss of a spouse, the loss of a sibling, the loss of a pet, the loss of a child, and more. These forms are also theoretically distinguished. I will expand the range of participants to explore further forms of bereavement. Designing *Be.side* with a young child or someone who has lost a pet will be distinct. So, *Be.side* can be enhanced in several ways via participatory design. Lastly, this research could be extended or supported further with more clinically-relevant evaluation of the technology's impact. This research can explore real-world applications to aid the bereaved, potentially integrating grief therapy or establishing channels for discussing the deceased in clinical settings, as discussed in Chapter 5. However, there is scope for a discussion regarding the potential scalability of this direction and what might be required to make it feasible to develop a product or service.

When conducting the long-term study, significant adjustments and substantial interventions occurred between each participant and myself. Further, through the participatory design process, participants had a sense of ownership, the artefact could be developed and personalised for the bereaved individuals. This is unique research, at the same time, evidently a limitation.

I anticipate that my PhD research will contribute to the fields of design, technology and bereavement. Last but not least, I would like to share the empathetic phrase that resonated with me during one interview:

"We didn't seem to know much about the deceased when they were alive. It's after my father has passed away, I thought, 'ah, that's the kind of person my dad was'. Through this research, I feel like I got to know my late father better, and it was meaningful."-Nara (P3)

List of Publications

1. Jieun Kim, **Exploring a Service in Relation to Scent and Memories for Preparing End of Life**, CHI2020 Workshop: HCI at End of Life & Beyond 2020.04.25-30 (ISBN: 978-1-86135-524-9)

2. Jieun Kim*, Jae-seung Roe, **Exploring the Case Studies of the Convergence of Healthcare and Mobility Design - Focusing on Accident & Emergency (A&E) Mobility Solutions**, The Korean Society of Science & Art, Vol.39 No.1, 2021

3. Jieun Kim*, Mina Shibasaki, Youichi Kamiyama, Tatsuya Saito, Kouta Minamizawa, **Exploring a New Way of Relationship between the Bereaved and the Deceased by Haptic Experience through Heartbeat**, AsiaHaptic 2022

4. Jieun Kim*, Daisuke Uriu, Giulia Barbareschi, Youichi Kamiyama, Kouta Minamizawa, **Maintaining Continuing Bonds in Bereavement: A Participatory Design Process of Be.side**, CHI2024 (DOI: 10.1145/3613904.3642386 / ISBN: 979-8-4007-0330-0/24/05)

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