University of California, Irvine

Preserving Family Histories and Memories with Tangible Technology

THESIS

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MASTER OF SCIENCE
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by

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DEDICATION

To

my family

who has stood by me every step of the way. They have encouraged, inspired and cheered me for all my achievements – small and big. They have held my hand, guided me, picked me up and shown me the light when I was low.

All I am today is because of them.

Thank you!

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UCI	University of California, Irvine
DLO	Deceased Loved One

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Abstract of the Thesis

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By

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One motivation underlying the adoption of digital technologies is that people are looking for ways to preserve their memories, document their lives and store their life's story. We often feel the need to capture moments in our lives, retain them and revisit some earlier ones. Materiality also plays a role in our memorialisation processes in the form of artefacts that we associate with our memories.

In this research, I study how tangible technology could be used to enhance our memorialisation processes by combining physical and digital memories. I employed two projects – Penseive Box and Phylactery - to exemplify this concept. Penseive Box aims to serve as an embodiment of a person who has passed away. Phylactery provides a way to explicitly secure memories to physical objects.

In order to understand people's perspectives on the systems, I conducted two ethnographic studies. Here, I present my motivations behind the two projects, their conception and the findings from the two studies that I conducted. From the studies, I conclude that tangible technology could be valuable for forging a connection between physical objects and our memories.

Chapter 1. **Introduction**

"Time does not pass, it is frozen and collected into an eternal present." I think this quote from the book *Memory Practices in the Sciences* (Bowker, 2005) perfectly explains how humankind documents its life experiences. Every passing moment becomes a part of our past, our history. From the time we are born, we are continuously making our unique history. It is this solitary past that defines us and forms a part of our identity. But, we are still aware of this history and remember the past. Even though, we have outlived those moments, they are still alive in the form of our memories. They are "alive" in this "eternal present" as our reminiscences. We can revisit those events and relive those memories anytime we want.

1.1. Memories

Reminiscing about our past is a complicated and involuntary process for most of us. A traveller remembering one of her trips, a group of friends reminiscing about their younger days during a reunion, parents recounting their times with their children, a grandmother narrating her life in her youth, a wife remembering the romantic times with her deceased husband, a person talking about their day at work, these are just some of the examples of how often we recollect our past. Sometimes this recollection occurs completely unexpectedly and sometimes, some event triggers the memories. This event can be a similar situation, a song, a smell, a quote, an object, a photograph, or just the ambience around which can bring back something so ancient and bygone. Interestingly, most of these memories involve other entities around which they form. Most of our memories are not just about us, but about us interacting with some context. It is this context that makes those moments memorable. Thus, our "eternal present" comprises of not only ourselves, but also other people, places, things, etc.

Human beings are social animals. From the time we are born, we form relationships with the world around us. We constantly interact with people around us. We develop emotional attachments towards them – friends, family and colleagues. I think that forging and maintaining meaningful relationships becomes an integral part of our lives and our identity. And these relationships or encounters also become an important part of our memories. These memories are also integral in characterizing their personalities in our perceptions. Our interactions with them over time dictate the person they are, and our memories help us build their personalities. In my opinion, we identify with them based on our history with them and thus, these memories are important for us, to maintain that person's presence in our lives.

Our memories with people close to us become even more important when we lose them. Our memories are all we have left to remember them by. A friend said to me following his grandmother's death - "I feel that I will forget her eventually, that I will not remember how she was like in a few years. And that scares me." This sentiment is not rare among people who have lost dear family members and friends. Most of us, therefore, try to find ways to preserve our memories. We write, collect photographs, letters, keepsakes, etc. to try to protect that person's identity.

Physical objects play an important role in preserving these memories. Many times, we have stories about some physical objects as well. We also tend to attach emotions to some of these physical objects. Some things become a part of our prized possessions. A gift from a dear friend, a watch worn by one's father, a family heirloom, travel souvenirs, etc. – these are all objects that represent memories and stories. Autotopography (Petrelli, Whittaker, & Brockmeier, 2008) refers to "an arrangement of those objects that people use to construct a sense of themselves by cultivating their physical environment." We use objects everywhere in our daily lives. Some of these objects do not have any particular functional or aesthetic value to us, but rather a sentimental one. We associate memories, histories and some background to the physical things around us. They trigger our memories and help us relive through those stories.

1.1.1. The need to preserve memories

Memories can be delicate and fragile. They tend to fade with time, and sometimes are even lost. We are constantly forming new memories and forgetting old ones. This loss of old memories is the main motivation behind most of the capture technologies today. We try to capture important moments of our lives and document them through photos and videos to store them for retrieval later on. In the prehistoric times, the humans engraved the walls of the caves to depict their lives and some important instances. The invention of writing and printing also took place because we needed a stable form of preserving the teachings and writings. Photos, videos, blogs, etc. – all these technological advancements try to address the need to document our lives so we don't forget these events. However, even with all the technological aids, we are still constantly trying to find better ways to remember things.

1.2. Research Interest

In this thesis, I investigate how tangible technology aids in memory preservation and memorialisation practices. I do this by exploring the use of two systems – Penseive Box (Chaudhari, Prakash, Tsaasan, Brubaker, & Tanenbaum, 2016) and Phylactery. With Penseive Box, I try to understand how a physical box with digital memories can be perceived as an embodiment of a deceased loved one. Phylactery explores how technology can be used to augment physical objects with a digital memory layer. The motivation behind these projects was to understand the importance of physicality in memory preservation.

Tangible technology seeks to provide a physical means of interaction with digital information. However, not a lot of research has been dedicated to studying the attachment of sentiments and feelings to physical objects and using this to develop newer forms of interaction with tangible technology. our technology to capture and preserve personal stories and memories in a "digital aura" that is always invisibly present within our heirlooms, objects, pictures, and possessions. By digitally connecting personal stories to physical objects, we believe that we can shape the future of the Internet of Things into one that is personal, emotional, and *meaningful*.

Even though there are studies that try to understand tangibility in memory preservation, it is still quite unclear how the physicality associated with memories can be used to design for better memory preservation. Thus, the purpose of this research is to address a significant gap in these research spaces around meaningful uses of hybrid physical digital systems for heritage preservation.

1.3. Thesis Overview

Here, I give a brief outline of the structure of this document. In Chapter 2, I discuss the previous work in this area and define the works that guide my research. The next Chapter 3 is about the methodologies I followed to design and implement the two projects. I discuss the study design and the methods I used for analysis of the data in Chapter 4. I expound the results of my analysis in Chapter 5 where I delve into each theme in detail. I conclude the research in Chapter 6 and lay out possible directions for future work.

Chapter 2. **Literature Review**

In this chapter, I discuss related work that has motivated and guided my projects through design, evaluation and techniques. I draw on four main areas of literature to highlight the background and explain them in detail below.

2.1. Memory

Human memory is a complicated concept. It is difficult to gauge what we remember and what we forget. However, in the book (Berntsen, 2009), Berntsen discusses how external prompts can influence our memories. She discusses how most recollections of past events are “completely unexpected and involuntary”. She also explains how our physical surroundings trigger these recollections. Sellen and Whittaker (Sellen & Whittaker, 2010) define the benefits of memory as the five R’s – recollecting, reminiscing, retrieving, reflecting, and remembering intentions. These five categories highlight the ways in which technology can be designed to aid our processes of remembering. Elise van den Hoven (2014) discusses the concept of internal and external memories and using external environmental cues to facilitate these remembering experiences. I wish to employ a similar approach in my research and analyse how a combination of external cues and digital technology enhances our recollections.

2.1.1. Memory with objects

Fishkin (Fishkin, 2004) proposes “metaphor” and “embodiment” as two axes for designing tangible technology. Van den Hoven and Eggen (Hoven & Eggen, 2004) identify the significance of everyday physical objects in designing TUIs. Holmquist et. al. (Holmquist, Redström, & Ljungstrand, 1999) define three main sources of information in terms of tangible objects –

- Containers – this is a “generic object” wihich can be coupled with some kind of digital information
- Tokens – if the objects physically represents the information it is associated with
- Tools - they are specifically used to manipulate digital information

They also discuss how physical objects contain information. They explain how souvenirs, keepsakes, etc do not necessarily contain the information that they represent – which is memories and history. Therefore, by the above definition, everyday physical objects serve as containers. Another object they use as an example is gambling tokens – and how they do not intrinsically represent their value, but do contain important information. This discussion also ties to Fishkin’s expression of metaphor and how objects contain metaphorical information within them. A study conducted by Holmquist et. al. (Holmquist, Helander, & Dixon, 2000) also explored how stories are associated to physical objects.

There are a number of systems that explore the story telling aspect of physical objects. The Reading Glove engages the user with physical objects by adding an interactive narrative to this interaction. The user wear a glove with RFID sensor inside it and holds objects (attached with RFID tags) in his/her hands to listen to a segment of a story. He/she then explores the surroundings and the context by interacting with more such objects to form the story. Tanenbaum et. al. (2010) explore the use of this concept of adding narrative parts of a story to objects and use an explicit audio communication to express them. From their studies, they ascertained that the users were “enacting the role” of the protagonist of the story as they held the objects to form their own interactive story. This idea of a story based object was one of the main originator of the idea of Phylactery.

A similar concept was explored by Mazelek et. al. (Mazalek, Wood, & Ishii, 2001) with genieBottles. Here, the project simulates the idea of genies in a bottle. The botte’s genie is “released” from it when it is opened. The genies tell us a story and also interact with each other when more than one bottle is opened. Holmquist et. al. (2000) designed a system which use barcodes to identify objects to “play out” their story. A barcode

reader scans the barcode and plays a video clip of an event as experienced by the object. This work deals with objects developing their own histories and giving humans an agency to experience it.

iTheatre puppets (Mayora, Costa, & Papliatseyeu, 2009) allows the user to manoeuvre hand puppets which contain RFID tags and accelerometers. The RFID sensor near the setting and the accelerometer are used to simulate the puppet's movement in a virtual environment. The puppet can also interact with its surrounding context in the virtual environment based on its movements in the real world. This design facilitates a different agency to the user of forwarding a story in the virtual world by interacting with the real world. A similar concept, SenToy (Paiva et al., 2003) was developed for younger users. Here, the puppets with sensors and accelerometers can be used to express emotions. The distance between the puppets is used to define the puppet's mood.

Odom et. al (Odom, Pierce, Stolterman, & Blevis, 2009) conducted a study trying to understand why we hold some things dear to us more than others. They conducted interview in the participants' homes and discovered that most of these objects endeared objects were because their history or their functional value. They explored the term "ensoulment" and "unensoulment" defined by Nelson and Stolterman ((2003)). They define "ensouled" objects as "things with a high strength of attachment" and unensouled objects as things with a low strength.

Materialising Memories (Hoven, 2014) is a new field of research which tries to design interactions with physical and digital memory cues to instigate recollection and reminiscence. There are some noteworthy projects affiliated to this field discussed below.

The Digital Photo Browser (Hoven & Eggen, 2004) is a project that tries to understand to elicit memories through physical objects. This is basically table top which can display various photos based on the objects that are kept on top of it. StoryShell (Wendy Moncur, miriam julius, elise van den hoven, & david kirk, 2015) is a personalized memorial object that was created by Wendy et. al. along with a participant who had lost a son. The work discusses the different stages the researchers and the participants went

through to design a “bespoke digital and tangible memorial” for the participant’s son. They designed a spherical container with an opening on top to reveal intricate decorations on the inside of the box. It has audio recordings stored in it and the play payback is controlled by touch. The memories are triggered by physical memorabilia about thier son in the form of photos.

Another project led by Rietzma et. al. (Reitsma, Smith, & van den Hoven, 2013) to preserve the indigenous knowledge of the culture of a South African community. Here, they designed a system which could help associate stories to physical handcrafted beads. The beads hold special meanings in the culture and therefore are crucial in preserving the knowledge. The system consists of a “Storyteller” and several handcrafted “eBeads”. The beads activate the Storyteller to record a story, or to play a previously recorded story. A story can also be deleted from a bead by passing a bead through a hole n the Storyteller.

There are also systems that aim to facilitate communication between two parties with the use of tangible technology. Cueb (Golsteijn & Den Hoven, 2013) is prototype designed to encourage interactions between parents and their teenage children. It is a pair of interactive cubes that display personal photos. They aim to facilitate a better communication between parents and teenagers by sharing photos, stories and experiences. 4photos (ten Bhömer, Helmes, O’Hara, & van den Hoven, 2010) is a similar system which aims to enrich dinner time conversations using a prototype which has a slideshow of photos. All the involved people can share their photos through this system. The users can also use the head of the prototype to navigate to photos.

Frohlich et. al. (2000) designed a speculative prototype called The Memory Box. This prototype is a small box containing a few objects inside it. The objects have audio recordings attached to them which are played back to the user once an object is picked up from the box. For their study, the authors interviewed participants to uncover some interesting outcomes. The study highlighted that women and children tend to develop more affinity towards this concept when compared to men. They also discovered that the participants were more interested in using this concept to give gifts and preserve family heirlooms. Most people did not wish to keep their memories for themselves, instead they

wanted to use the conceptual technology to store their memories/messages for other people and use them as gifts.

The Living Memory Box (Stevens, Abowd, Truong, & Vollmer, 2003) is a similar project pertaining to archiving important moments in a home setting. The system involved a recording device and a "safe place" for holding an object. The placement of an object in the safe place would prompt the recording device to document the occasion. The purpose of this project was to provide an easy-to-use archival device for families. The findings from their interview study show that people preferred a system that would:

- Remove "work" from collecting, annotating and revisiting memories
- Include physical objects as a primary feature
- Develop 'natural' interactions
- Enable storytelling through centralization of artefacts

I build on the above four concepts and consider them as a part of my design principles for my projects. The above projects represent a concise explanation of the current understanding of association of objects with memories. I addressed these conclusions while formulating my research and designing the projects.

2.1.2. Memory with deceased loved ones

When we lose someone close to us, we rely on our memories with that person to reminisce about out times with them. Many cultures have specific ways of honoring a deceased loved one. Traditional methods of around remembering the deceased involve funerary rituals (Bolton & Camp, 1987). Creating memorials and organizing memorial services are another way for most of us to honor the dead (Grider, 2007; Hass, 1998; Jorgensen- Earp & Lanzilotti, 1998).

Social media is increasingly becoming a place to commemorate and honor our close ones (J. R. Brubaker & Hayes, 2011; Jed R. Brubaker, 2013). Brubaker et. al. (J. Brubaker, Kivran-Swaine, Taber, & Hayes, 2012) show how social networking sites "become unanticipated memorial spaces that can serve as archives of the lives of the

deceased and social space for the bereaved". Massimi et. al. (2011) suggest four areas – materiality, identity, temporality and research ethics/methods – as the four main areas that can map out the research related to death and memories.

2.2. Tangible User Interfaces

There has been abundant research done in the area of tangible technology and memories. The paper on Bricks (Fitzmaurice, Ishii, & Buxton, 1995) was one of the first ones to explore the concept of everyday objects as computing devices. They called tangible objects as "bricks" and used them as input devices and introduced the idea of Graspable User Interfaces (GUIs). Ullmer and Ishii (1997) then coined the term Tangible User Interfaces (TUIs). They discussed how our environment can be used for interacting with technology rather than a screen. They explain how two sources of information sinks can be used to communicate messages – foreground and background. Foreground interaction deals with actively interacting with tangible user interfaces to conduct our desired actions. Background interaction pertains to ambient environment where a change in the color/sound/lighting can be used to communicate a message. In a later paper (Ullmer & Ishii, 2000), they define the frameworks for the tangible user interfaces and try to highlight the areas of interest in the field. These form the foundational of tangible technology, but more research needs to refine the ideas and explore its effectiveness in a societal context.

Ishii et. al. (1997) in their work discuss the need to move away from digital interfaces and employ everyday tangible objects to mediate our use of technology. They use "phicons which are physical icons" to facilitate interaction with their systems. metaDesk is one such system which can use a phicon in the form of a physical model of building to generate a two dimensional map around it. The phicon can now be used to rotate and translate the map on the desk with basic movements. Another system that uses phicons is ambientRoom that uses audio feedback to communicate to the users his interactions with the physical objects in the room.

This society centric approach has been an important topic in this field recently. Fernaeus et. al. (2008) define this change in focus as "practice turn in tangible

interaction". They emphasize four main areas where ideals are shifting – information centric to practice centric, properties of system to interaction in context, individual to sharable, objective to subjective. Hornecker and Buur (2006) discuss a framework to incorporate a social aspect to tangible interaction. The framework highlights four main themes – tangible manipulation, spatial interaction, embodied facilitation, and expressive representation. They define tangible manipulation as physical representations of objects combined with a computational form. Spatial interaction represents "the interaction in real space" and embodied facilitation refers to the materiality of computation directs group behaviour. Our perception of the physical and digital forms is expressive representation.

The practice turn or the change in the approach towards tangible technology is fundamental for contemporary and future research in this area. It defines certain aspects that need to be addressed and extends the previous frameworks to fit the current needs.

2.3. Magic

As discussed earlier, Fishkin (2004) defines two main aspects of tangible interaction as embodiment and metaphor. He also discusses the use of magical metaphors to express a way to influence the interaction. Svanaes and Verplank (2000) explore how metaphors such as telepathy and magical relics can be associated with such interfaces. In his paper, Tognazzini (1993) draws striking parallels between principles of magic practice and Human Computer Interaction. He lists the following few ideas that are similar in both the fields –

- Consistency – the regularity of the trick or the interface
- Unity – the uniformity of the magical trick or an interface
- Keeping it Simple – simplicity makes an idea relatable. A magician uses it to make the audience understand a normal action. Designers make an interface simple for the same reason.
- Use of real world metaphors – using the mental models from everyday life and the world

- Techniques of user testing – Magic and user interface are similar in the way they are tested.

From these descriptions, it is clear that magic can be easily associated with new interactive technology. Eamon ("Technology as Magic in the Late Middle Ages and the Renaissance," n.d.) discusses how new scientific and technological advancements have always been perceived as a work of magic in the early stages. His article quotes an Italian philosopher from the early seventeenth century – "For technology is always seen as magic until it is understood, but after a while it becomes ordinary science." Magic does hold a fascination in our minds. Randall Smith (1987) says that magical features "enable the user to do powerful things that are outside of the possibilities of the metaphor". He discusses the differences in literalism and magic with respect to alternate reality. I use the above ideas to communicate a magical aspect for my project on Phylactery.

2.4. Summary

In this chapter, I present my inspirations and the foundational pieces for my research. I utilize the knowledge that I gained from these studies and projects to develop and guide my research. In the following chapter, I discuss how I used these principles to design and implement the projects.

Chapter 3. **Design and Implementation**

In this chapter, I discuss two projects that establish the foundation of my thesis. In my research, I have explored themes about embodiment (with Penseive Box) and about sentiments related to physical objects (Phylatery). I designed these two systems to communicate to people the above mentioned background concepts. Here, I describe the design process behind these projects and their implementation.

3.1. Penseive Box

In this digital age, many of us have innumerable photos, videos, audio clips, etc. that capture important as well as mundane moments in our lives. Social media also plays an important part in our lives and forms a part of our personalities. We post updates, life events and other media on social networking sites. Organization of all these information sources is increasingly becoming an inconvenience for most of us. This inconvenience is heightened when we lose someone close to us. We find ourselves going back to all these memories to remember that person and gather all their distributed memories. Penseive Box aims to provide an altar to collect and preserve all such important memories about a person. We propose to export the deceased person's social media profile into the digital screen of Penseive Box. This would provide a centralized way to access their online personality and memories. The box also glows on special occasions like birthdays and anniversaries. This functionality provides gentle reminders to the user so that he/she does not forget an important event. The LED panel on the box would light up on special occasions to give gentle reminders to the user. These reminders can make sure that the occasions are not forgotten.

Figure 3.1 - Penseive Box

With Penseive Box, we aimed to understand the memorialisation practices concerning the death of a loved one. It is a wooden box with a digital screen attached to it. The idea we wanted to convey with this prototype was for it to serve as an embodiment of a deceased loved one. By embodiment, we mean how people associate the physical box with the person they have lost. We wanted to understand if people would like to maintain their relationship with their DLO (deceased loved one) through a physical manifestation of all the memories with them. This idea differs from the meaning of embodiment used in tangible literature. In some literature pertaining to this, the authors discuss how it's about the phenomenological experience of being embodied (Dourish, 2001).

The name – Penseive Box – is inspired by the concept of the Penseive from the Harry Potter series. In the books and the movies, Penseive is a shallow bowl filled with a magical liquid. It is used to review one's memories and see the happenings of some past events. In many ways, the system that we envisioned has similar utilities of providing a person with a gateway to his/her old memories. In this case, however, these memories are specific to one person, a close friend/family member that they have lost.

Michelle is about leave her house for work. But, in the corner of the room, she notices her Penseive Box (the one she has made for her grandmother) is glowing. She instantly remembers that it was her Gran's birthday today. She opens the Penseive Box to turn off the LED lights. She sees one of her favourite pictures with her Gran on the screen and her quote – "Never say no to adventure." She goes to the photo album and sees some photos of her grandmother. Then she leaves for work without spending too much time with it. Later in day, she returns from work and open the Penseive Box again. She looks at all their photos and videos. She remembers of some inspiring stories her Gran used to tell her. She feels good that even though her Gran is no more, she has left behind so many beautiful memories with her family.

We conducted interview studies to understand the general perceptions about this concept. We interviewed adults who had lost someone in the past 5 years and asked them about their perceptions on Penseive Box. The results and analysis of this study are discussed in detail in the following chapter. However, there was one very clear conclusion that could be drawn from the interviews even with a preliminary analytical review. All of the participants expressed their desire to own a system that provided them with the flexibility and agency to curate their own memories. They favoured a system that allowed for greater personalization to let them collect their memories and change the interaction according to their preferences. The results of these interviews led me to design a more flexible and autonomous system for memory curation. I discuss this system named Phylactery in the next section.

3.2. Phylactery

Phylactery provides a way to explicitly express the stories/memories behind physical objects. As discussed previously, we associate a sentimental value and a background to some objects. Phylactery expresses this history behind the object through an audio recording. It allows the owner of the object (or any other person who wishes to preserve his/her memory) to explicitly attach the story behind it. He/she can do so by recording his/herself talking about the object. Phylactery will then secure this recording with the object and it can it preserved.

Phylactery is a wooden platform with a three LED lights and a microphone attached to it. The user records the story/memory about the object into the microphone. I describe its functionality in the following usage scenario:

> Dana is in her hometown, visiting her grandparents. She is visiting them after one whole year and is excited to spend her grandmother's birthday with them. She is always excited to visit their house because of all the things they have there, she loves listening to her grandmother talk about the artefacts around. She particularly loves the story of a pen that adorns the mantle. This time, she brought her Phylactery setup so that she could permanently attach the memories to all the objects her grandparents hold dear to their hearts. One afternoon, she sets up Phylactery on their coffee table and also keeps some of the interesting artefacts around it. She picks up the pen, sticks one RFID tag onto it, places it on Phylactery and asks her Nana to tell her the story behind the pen again. Nana tells Dana about the time she first met her grandfather.
>
> "I was one of the few women who went to college in those days. So, you can imagine how terrified I was the first few days. I was very serious about college and my studies, and I didn't want to waste an excellent opportunity. And, I was very meticulous; I would reach for classes way ahead of time, secure a seat in the front row, set up my stationary on the desk, and revise my notes from the previous classes. One day, I got late and couldn't get on the bus. And I started panicking. I walked to college, but of course was late. I entered the classroom, ashamed and red-faced. I had to sit in the back because the seats in the front were occupied. And to my horror, I realized that I had forgotten to bring my pen with me! I asked the man beside me if he could lend one to me. He did not have one – even for himself. He was just sitting there listening, without taking any notes! By this point, I was very close to losing it. But the man, he started asking around if someone had a spare pen. And he found it and gave it to me! That man, as you already know is your grandfather. I somehow kept the pen with me and never returned it."

After Nana's narration, Dana picks up the pen and keeps it aside. Now she can listen to this every time she visits her grandparents. She does this with a few other objects as well. She takes a few such interesting artefacts with her to her house. She can listen to her grandmother talking about a lamp/tablecloth/etc. by keeping them on Phylactery again.

The word Phylactery means 'a magical object that stores a piece of one's soul' (Frazer, 1995). It has several references in contemporary games like Dungeons and Dragons. Phylacteries are used to capture a piece of a person's soul in an object, thus ensuring immortality for the person. Another pop culture reference that uses this concept is *the horcruxes* from Harry Potter. The idea behind capturing parts of a soul inside inanimate things is to protect that person from death. Since the person's soul is preserved in an object, the person does not die even if his/her body is hurt. The only way to kill that person is to destroy all the phylacteries that he/she might have.

Continuing with the metaphor, I refer to the idea of *ensoulment* of objects with a magical twist. The ensoulment (borrowing the terminology from Odom et. al. (2009)) of the object persists as long as the tags are attached to it. This tag ensures that the memory is captured inside the object and will not fade. The memory can be relived every time the ensouled object is placed on top of Phylactery. The Figure 2 shows a picture of the system.

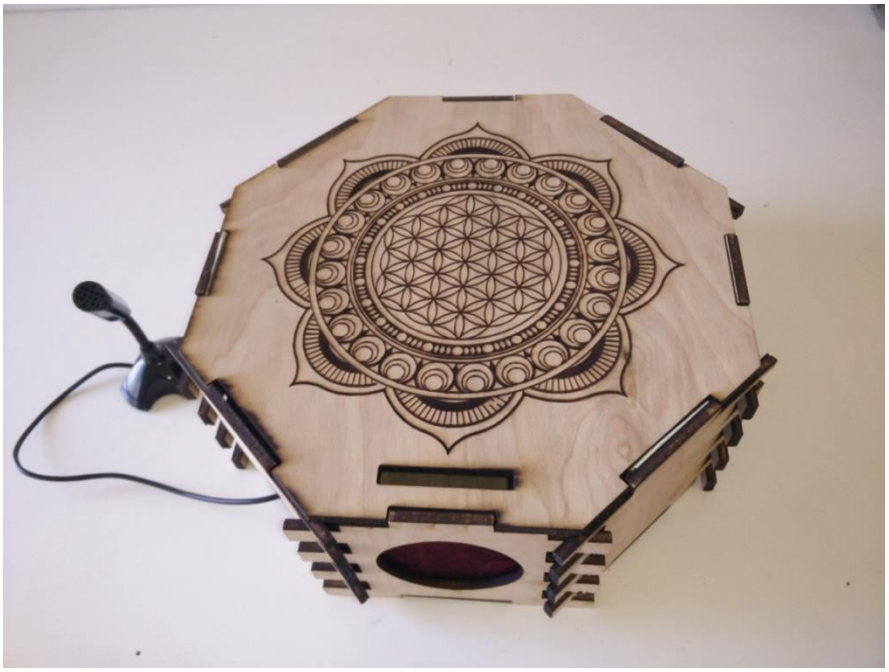

Figure 3.2 - Phylactery

To allow a user to eliminate the memory (soul) from an *ensouled* object, the Phylactery *unensouls* an object if it senses the same object three times continously. There could be various reasons for the user to wish to delete a saved memory – he/she does not wish to remember it anymore, there was a mistake made the first time the memory was recorded or there are additions to the original memory.

The box is octagonal in shape with each of the eight edges approximately 4 inches in length making the box 14.5 inches in radius. The height of the box is 5 inches. The hardware components are kept inside the box. The top of the box has a pattern that symbolizes immortality, family values and expansion of one's soul. The pattern draws from various symbological references to represent the classical and mystical undertones of the project. The pattern on the top of the box (as shown in Figure 3) contains most of these symbols. I give a brief explanation of all the symbolic meanings that we wish to convey with this design –

- Octagon and circle – these shapes represent infinity, totality and regeneration(“Symbolic Meanings Blog by Avia Venefica » Blog Archive » Symbolic Meaning of Octagon,” n.d.)

- Flower of life – in Paganism, the circular patterns in the centre of the Figure 3 symbolizes the connections between all sentient beings and “the basic information of all living things”.(“Flower of Life - A Thorough Explanation,” n.d.)

- Mandala – for Hindus, the different circular layers on the mandala express the different aspects of human life – friends, families and communities. The layers also imply that the systems inside human body and the universe are the same.(“Mandalas - A Thorough Explanation,” n.d.)

- The Lotus – this represents purity of body, mind and spirit according to Buddhist beliefs. The unfolded petals convey the idea of “expansion of one’s soul”.(“Lotus Tattoos: Their History and Meaning - Richmond Tattoo Shops,” n.d.)

With the help these symbolic references, we wish to associate the concepts of immortality and family values with Phylactery.

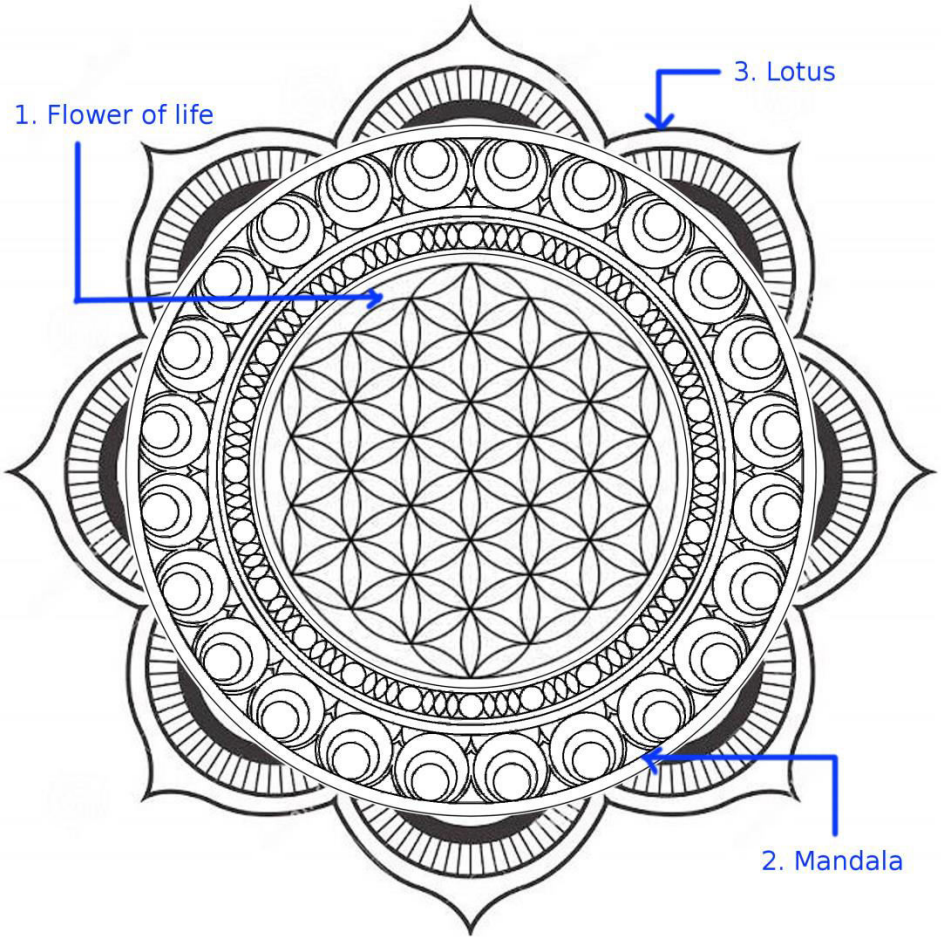

Figure 3.3 – Phylactery Pattern

On three edges of the box, I have provided openings for the speakers and the cables. Two of the openings are for the speakers and are covered with a velvet fabric to maintain the antique look.

3.2.1. Technical Implementation

To implement the concept of Phylactery, I collaborated with two of my classmates to develop the system. We used RFID (Radio Frequency Identification) tags as a link between physical objects and the technology. We employed a computer to run the instructions required to achieve the functionality. Every time the object is placed on top of Phylactery, the RFID tag (attached to the object) communicates the required information to identify the object.

We wrote a Python script to execute all the required operations of this system. We also created a database to store every RFID that has been used. This database basically serves as an archive of all the objects that have been ensouled. Every time a new RFID (a new object placed) is read on Phylactery, the program generates a new entry in the database with the unique identifier of the tag. The audio recording done while the new RFID is on Phylatery is saved in a designated folder on the SD card. The database entry also stores the path of the location of this audio recording. Whenever, the system detects a RFID tag, it checks if the RFID is already present in the database. If there is an entry in the database with the unique identifier, the system retrieves the location of the associated audio recording and plays it back. In order to run the python script on bootup, we wrote a shell script to call an execute command for the python file. Here, I describe each of them in detail -

- Raspberry PI – This is the component that processes and controls all the information flow. The program that communicates with the other hardware components and directs the working of the system (the python script) runs on a Raspberry PI. This is a basic low cost computer, mainly used for embedded systems. We chose to work on a Raspberry PI because of its small size and basic functionality.

- RFID Reader (Ph1dgetRFID) – We used RFID tags to identify each object with its associated audio recording. To use RFID tags, we used this sensor that would read the unique id of each of these tags. Each RFID tag has its own unique identifier. We used this identifier to retrieve the audio recording for playback.

- MicroSD card (64 GB) – we used a separate SDcard to store the audio recordings as Raspberry PI does not have an in-built memory. Since we are using audio files that need more storage space, we used a card that had 64 GB of free space.

- USB Microphone – To provide a way to record the story that the users narrate, we used a plug-and-play microphone.

- USB speakers – The speakers to play back the stored audio recordings.

- LED lights – since this whole setup hides the technological functioning in the background, it was important to provide a simple way to give feedback to the user and notify him/her about the functions of the system. We used three differently colored LED lights for this. Each of these lights conveys a different function that the system is currently running.

These components explain the choice of the hardware components for Phylactery. The design elements discussed above were important to conceptualize the idea of Phylactery.

3.3. Summary

In this chapter, I discussed the design methodology behind the two projects. I explore the motives behind them and elaborate on the need for such systems. I also described the exterior configuration and the technical aspects of Penseive Box and Phylactery. In the following chapter, I discuss the ethnographic studies and my analysis methods in detail.

Chapter 4. **Methods**

In this chapter, I delve into the interview studies for the two projects. I applied ethnographic methods to conduct the interviews that I conducted for the research on the two projects.

4.1. Penseive Box

As discussed in the previous chapter, Penseive Box explores the concept of embodiment of a deceased loved one. Specifically, the following were the main research questions we wished to address with the study –

- Would the people perceive Penseive Box as an embodiment of a close friend or family member that they lost?
- What would be the temporality of use of this system? When would they use it? Would they ever discard it after using it for certain duration of time?
- What role does the physicality of the box play in this scenario? How does a physical box affect the way people perceive this concept? Do the perceptions differ from online memorialisation practices?

To investigate the general attitude towards Penseive Box, we interviewed participants who had lost a loved one in the past five years. We posted recruitment messages on social media and contacted probable participants through the snowball technique. We recorded the audio for all the interviews for later transcription and analysis. The interviews were either face-to-face or via video conferencing and spanned a period of approximately one hour. They were largely open-ended and semi-structured interviews allowing us to make the experience as comfortable as possible for the participants. This was a speculative prototype where we explained the hypothetical

scenario of the participants owning Penseive Box. We asked them to imagine how they would use a system like this to elicit their opinions.

Prior to the interviews, we requested all the participants to bring some objects that reminded them of the person they had lost. We observed that the physical objects were helpful in eliciting meaningful and deep discussions about their experiences with death. We believe that such level of responsiveness would have been very difficult to achieve if the physical objects did not aid the discussions.

We divided the interviews into two essential parts. In the first part, we encouraged the participants to settle in, become comfortable and talk about their experiences with death. We discussed their relationship to the people they had lost, how they dealt with their death and some demographic questions. We also discussed the physical object that they brought with them, the object that reminds them of the person they lost.

The first part of the interview allowed us to lay the foundation for the next section where we discussed the Penseive Box by establishing the nature of the research and its need. Here, we used basic sketches of the box and the digital interface to ask the participants about their thoughts about the system. These sketches are shown in the following figures. We did not wish to provide the participants with any well-formed ideas about the design of the system. Instead, we wanted to evoke their preferences and imaginations about the interactions with the system. We encouraged them to express their preferred interactions and their usage scenarios. These conversations gave us a positive feedback and allowed us to judge the desired usage scenarios of Penseive Box. Both parts of the interviews lasted around 30 minutes each.

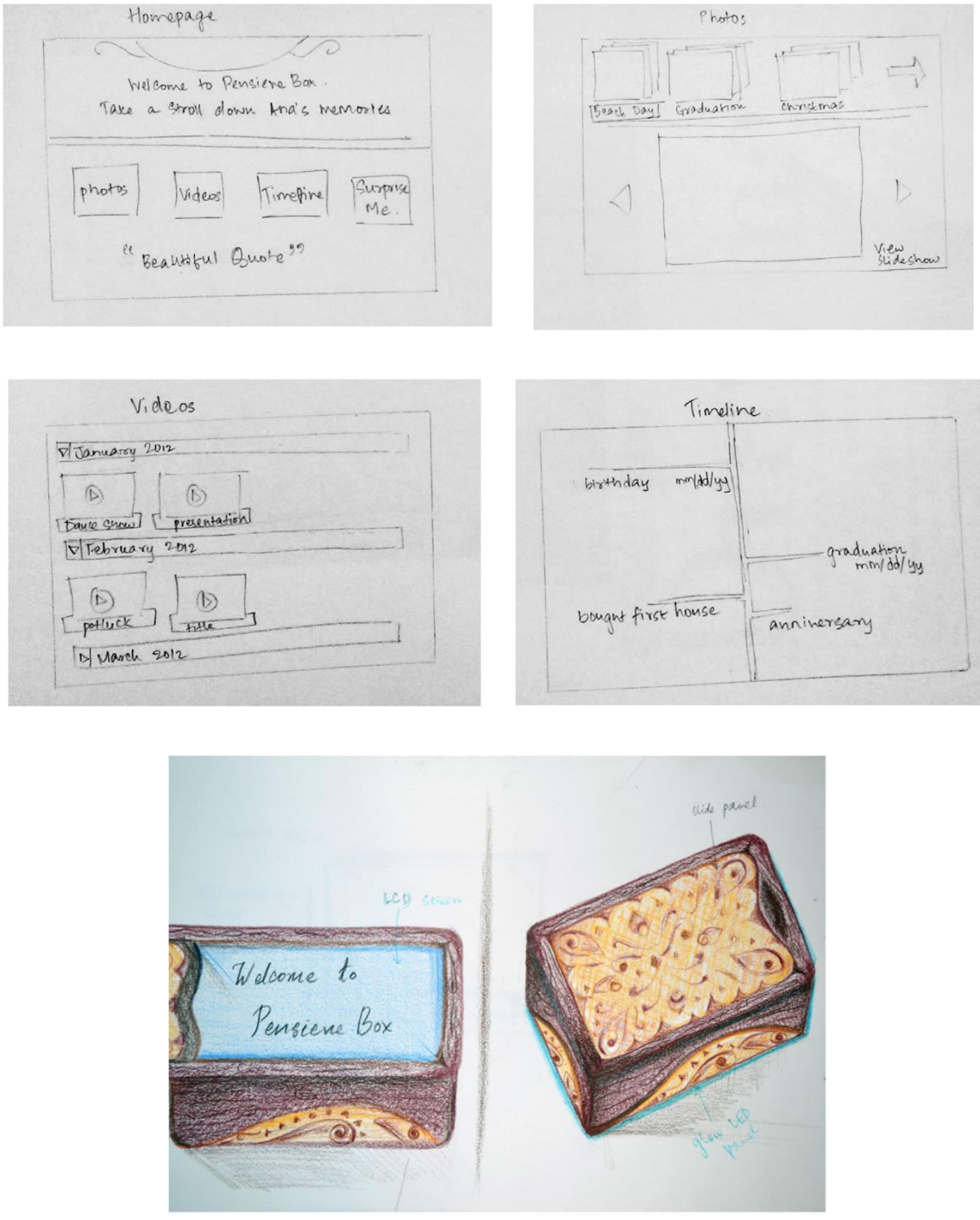

Figure 4.1 – Penseive Box Sketches

After the data collection, we transcribed the audio recordings of the interviews. We then analysed them using a form of qualitative analysis informed by grounded theory methods (Strauss & Corbin, 1998). We thoroughly reviewed the transcriptions to look for emerging concepts. Once we coded the data, we dug in deeper into each of these thematic components to understand the minute details about each of them.

4.2. Phylactery

For Phylactery, I used a similar interviewing technique to investigate people's thoughts about the system. I recruited the participants through social media and by posting flyers across the UCI campus. Like the previous study, I also recorded the audio of the conversations. The goal of this work was to investigate existing physical and tangible memorialization practices among people, and to explore how these practices might be augmented or enhanced through the application of a new technology.

I believe the best way to answer the research questions for this setup would be to employ an 'in the wild' (Brown, Reeves, & Sherwood, 2011) study with the participants interacting with the prototype in a home environment over a longer duration of time. Since my idea involves the users interacting with the system in their homes and on a regular basis, a study that analysed their daily lives would be more insightful. A study like this would also surface the type of interactions people would have with the system – whether it is for preserving memories related to heirloom objects, or something used to document their lives, conversational piece. However, due to the time constraints of my degree, I was not able to conduct an extensive study like this. Instead, I resorted to an interview study where I investigated people's reactions to the idea of owning a system like Phylactery in their homes. In particular, my research questions were –

- How does the participant's family currently preserve family history?
- What part of this process of memorialization is tangible or material?
- What do the participants think of augmenting the tangible objects with a digital layer (audio/video/digital photos, etc.)?

- When given a new technology for physical/digital memorialization, how to participants respond?

- What challenges do participants experience when using a tangible memorialization technology?

- What interfaces are suitable for a hybrid physical/digital system of memorialization?

For the recruitment, I posted messages on social media and sent personal and personal emails to participants. I also posted flyers in some popular areas of the UCI campus.

I collected demographic information like age, gender and location to form a better understanding of how variations in these factors affect people's responses. Kleine et. al. (1995) discovered a skewed interest level in the different age groups. I wanted to examine this variation in the inclination to use this concept with age. Also, I believe that the above segregation accounts for the main stages of our lives. The young adults include the people who are trying to or have recently gone through the self-realization and self-making phase of their lives. Adults are the people who have settles in family lives and careers. They are also thinking about family histories more than before because of their kids. Older adults are retired people who are seriously thinking about what to leave behind for their future generations.

I conducted semi-structured interviews to explore their perspectives about attaching "ensoulment" of objects discussion on family histories in connection to physical objects. It was crucial to conduct open ended interviews to encourage the participants to lead the conversation and reveal deeper insights and opinions on the project. I also encouraged them to interact with the prototype (Phylactery) to elicit their experiences while using it. Therefore, the interviews were mainly two-part; in the first part, we discussed family heritage and memory preservation. The second part was utilized in interacting with the Phylactery prototype. The interviews were conducted individually and face – to – face at the author's home. This setting allowed the participants to easily use the prototype and fostered effortless conversations with me.

Prior to the interviews, I had requested the participants to bring an object of emotional value to them. From previous experience of conducting a similar study, I feel that inclusion of such probes boosts the quality of the interview to surprising levels. We had detailed dialogues on the objects that the participants brought in for the interview. They also used the prototype to augment these objects with their memories or stories.

After the analysis, I analysed the interview data. I first searched for some recurring themes that surfaced in the interviews. I used these themes to code my data. Once I had the broad categories, I tried to delve into each of them more thoroughly and tried to conceptualize them with theoretical support.

4.3. Summary

Here, I outlined the design considerations and the process of analysis for my projects. I discussed the design decisions that resulted in the implementation of Penseive Box and Phylactery. I also explained my analysis process in this chapter. In the next one, I present the findings of these studies.

Chapter 5. **Analysis**

I dedicate this chapter to discuss the results of my studies. I coded the data to uncover some recurring ideas across the interviews. The coding technique allowed me to discover a few underlying concepts from the two studies (Strauss & Corbin, 1998). Here, I describe the concepts and discuss their significance. I also try to connect these findings to the existing literature and situate them with respect to the current knowledge in this field. I do this to present a perspective that highlights the usefulness of the themes uncovered.

5.1. Penseive Box

The study uncovered some interesting insights into the way people think about embodiment of their loved ones. We found that everyone develops a distinct memorialisation process; some make an altar of the people they have lost, some make a photo album and look at it whenever they are missing the person, etc. However, most participants expressed an appreciation for the notion of Penseive Box. They, in general, responded quite positively to the idea of owning a physical manifestation of their relationship with someone they had lost.

In the following table, I describe the demographic information collected from the study and the physical artefact that each participant brought for the interview. I believe, age and gender are important considerations because they highlight the some affinities that might differ based on gender and age. Previous studies have also concluded that the responses to similar concepts vary based on these factors (Frohlich & Murphy, 2000; Kleine et al., 1995). Even though, the participant pool of this study isn't suitable to draw new conclusions about this, we think there are some findings that can strengthen the previous conclusions. The two men, although appreciative of Penseive Box, did not express as much enthusiasm about using it as the women did. The participant pool fell in

the same age range (except one) and therefore we could not draw any significant conclusions based of their ages.

Participant	Age	Gender	Location/ Nationality	Deceased Loved One (DLO) discussed
P01	34	Female	Irvine/ American	Photos of Grandfather
P02	28	Male	Mumbai/ Indian	A small little purse that Grandmother carried
P03	60	Female	Palo Alto/ American	A catalogue, a book they wrote together, other books they studied together
P04	36	Female	Redlands/ American	A showpiece and the memorial pamphlet
P05	24	Male	Mumbai/ India	Woollens knitted by Grandmother
P06	24	Female	Irvine/ Indian	A letter from her Grandfather, a chair he used to sit in

Table 5.1 – Demographic results for Penseive Box Study

The above table shows that a wide range of physical objects can be ascribed to the memory of a loved one. It is also interesting to note that the participant pool was bicultural with natives from the USA and India. The responses to Penseive Box from these cultures were not evidently different. We expected the opinions to differ based on the religious and cultural backgrounds, but the limited participation pool did not offer a decent insight to reach a conclusive decision in this respect.

During the analysis, we observed some ideas that were repeatedly alluded to in all the interviews. I discuss these broad categories that formed themes in the conversations we had during the interviews. These were helpful in addressing our research questions and offered interesting basis for a stricter inspection. I use the acronym DLO for the following section to denote the deceased loved one the participants lost.

5.1.1. Personal Memorialization v/s Automated Memorialization

Initially, we designed Penseive Box to include the online profile of a person, exporting all the necessary data like photos, videos, life events, etc from social media on the digital screen. This approach offered a simple way to collect the necessary information needed to actualise the concept. However, we observed that the participants expressed a desire to curate and organize the memories themselves. The additional cognitive load of collecting all the important moments and compiling them together was a favoured course of action rather than extracting data only from social media. Participant 06 said, “I would like to add in the photos that I have of him as well... Because there not everything is on social media...I have better photos...More than the Facebook stuff, I would give more importance to the things I have of him”. Correspondingly, Participant 05 indicated that he does not “give much importance to Facebook or social media. I don’t like to use it much. So, I wouldn’t export any data from there, I would gather up my own photos and the few videos”. Most participants gave similar responses when asked about the data in social media.

Participants also expressed their desire to customize the “look and the feel” (P02) of the box to represent the person’s personality. The participants appreciated the artwork on the wooden box, but favoured customizing it to illustrate some outstanding features about the person they had lost. They also suggested that they would change the digital interface to suit the data that they want to preserve. Some of the participants did not wish to include a separate page for videos, as they did not have many; some wished to add other forms of media – like a map of the places their loved one had visited; one participant wished to include the letter her grandfather wrote to her, etc. All these preferences point to the fact that the participants intended Penseive Box to

resemble the person they wished to dedicate it to. This inclination is emphasized when the participants discuss the quote on the homepage of the screen. In the sketches, we deliberately used the generic words – “Beautiful quote” to extricate people’s opinion about it. A majority of the participants proposed to use a quote (or a set of quotes) from their DLO. One participant said, “I would like to see things that he (grandfather) had said to me, or something he used to say in general to come up here...something he would say to me, some life advice, etc. I would not even look at it if it something just lifted off the internet.”

These responses indicate an underlying theme that personalization or customization is central to support the development of a personal connection to this technology. Participants associated intimate sentiments and personal memories with Penseive Box. Thus, having an interaction that was personalised and represent the special nature of their relationship to the box was crucial for them.

5.1.2. Social Media as an incomplete record of deceased loved one

As discussed earlier, we envisioned using the online identity of the DLO to serve as the information that would populate the digital interface of Penseive Box. However, we discovered from the interviews that the participants did not see social media as a comprehensive representation of their close friends and family. One participant reported, “There are some important life events on Facebook, but sometimes it’s the little things like random surprise visits that matter. These things are not on social media.” Another participant extended this opinion by saying, “Facebook and other social media platforms...these are very public places. I don’t think everyone is like their online profiles, there is more to us than that.” These participants introduce the notion of an inadequacy in online identities. They suggest that our interactions with people close to us do not conform to our online correspondence with them. Therefore, social media and our online personalities are not solely useful to forge an intimate connection.

However, not many participants had lost someone with a strong social media presence. Therefore, a concrete conclusion on people’s perspectives can not be

reached. We believe more research into this specific aspect needs to be done in order to reach a strong decision.

5.1.3. Favouring the gentle reminders on special occasions

We designed the box with narrow LED panels on the edges that glow on important dates from the DLO's life – for example, birthdays, anniversaries, graduation, etc. The participants admired the idea of such gentle reminders on special occasions. "Even though these people are important to us, there might be times when we forget their birthdays. So, I would like to be reminded of it", said participant 04. On similar lines, participant 05 expressed – "I love this idea because it tries to make its presence felt...I might remember the occasion, but it will still be a good idea to see that the box I have for her is glowing." The participants were receptive and excited about this concept and thought it offered an interesting mode of interaction with Penseive Box. They also did not see this function only as a form of reminder, but rather another manifestation of their correspondence with their DLO.

We were surprised to realize the level of participants' excitement for the LEDs glowing as it contrasts the conclusions drawn by Brubaker et. al. in their study on online bereavement. We believe that such conflicting results are due to the public and private nature of social media and Penseive Box respectively. We have established in the previous sections that this concept serves to form an intimate and personal connection. Thus, it is possible that the perceptions behind the two pieces of technology led to the conflicting conclusions.

5.1.4. Unwillingness to share the box

A majority of the participants asserted that they would want to claim a sole ownership of Penseive Box. They approved of their close friends and family using the box for their DLO for small periods of time, but did not favour possessing it jointly. Participant 06 expresses this sentiment appropriately – "It will not be the same thing if my brother also has the same box. I would want him to have something similar one, but

not the same." Participant 01 introduces another reason why sharing this box might be an non-ideal solution, "I want this box to be about my relationship with him (grandfather) because I do not know much about him, but I did spend some good times with him and he was very warm and sweet. So, I want to remember that more than anything else." Sharing a personal piece of technology that reminds us of someone close, therefore, becomes a difficult scenario of use.

Again, this conclusion is distinctly different from the memorialization practices online where shared ownership is assumed (Jed R. Brubaker, 2013). We believe the reason to be the same as explained above – association of Penseive Box with personal relationships causes the change in viewpoints about sharing it.

One recurring abstraction that arises from all four of the above themes is the correlation of Penseive Box with personal and confidential memories. We equate this outcome to embodiment and conclude that the participants indeed perceive Penseive Box as an embodiment of their lost loved one. In response to the LED lights glowing on certain significant dates, Participant 06 said - "Also, if it is glowing on these occasions, it would make me feel that it is actually that person." In this context, we mean embodiment as a medium through which memories with a deceased person can be revisited. This forms a way to bear a physical manifestation of one's memories and interactions with a person.

5.2. Phylactery

The study for Phylactery uncovered four thematic concepts that can be significant in understanding how people attach sentiments to objects. The participants conveyed a positive attitude towards Phylactery. However, they reported a number of user scenarios that did not pertain to attaching memories to objects. One participant said, "I would use it as a podcast player! It looks cool too, so I will just keep it on my bedside table and listen to podcasts or something before going to sleep." Another interesting use that P08 suggested was to use artefacts around the house to leave

messages for family members. P04 proposed using the idea for practical purposes like making a task list with objects associated with each task. However, most participants emphasized the value that Phylactery offers in preserving family histories and developing legacies across generations.

As with the analysis on Penseive Box, I collected some demographic information about the participants. Out of the eight participants in my study, two were men who can be classified as adults (24 - 40) based on the age distribution discussed in the previous chapter. As expected from the responses (Frohlich & Murphy, 2000), the men did not show exceptional eagerness to use this system when compared to the women. P06 aptly said – “Yeah, I can see my wife really loving this thing...this is the kind of thing she would definitely use!”

For the age considerations, three of the participants were young adults and they did not have any children. These participants did not express strong concerns about fading memories and delicate family histories. The general response from this age group was positive and directed at alternative ways of using the concept. This observation is not surprising as it corroborates the conclusions made previously (Kleine et al., 1995). In the table below, I give a brief about the demographic distribution of my participant pool. I also list the objects that I discussed with each of them to form an interpretation of the types of objects associated with memories and sentiments.

Participant	**Age**	**Gender**	**Location/ Nationality**	**Objects Discussed**
P01	35	Female	Tustin	Calculator from brother, Heirloom from neighbour
P02	31	Male	Tustin	Photos, clothes
P03	24	Female	Irvine	Brush pen, religious idol,

				Grandfather's utensils
P04	38	Female	Irvine	Books, phone, soft toy, T-shirt
P05	26	Female	Irvine	Laptop cover, gift from friend, scarf
P06	40	Male	Irvine	Gift from wife
P07	34	Female	Irvine	Gift from advisor, furniture
P08	28	Female	Irvine	Necklace from Grandmother, photo of sister

Table 5.2 - Demographic results for Phylactery Study

I now present the underlying themes from the interviews below. These are concepts that resonated across all the interviews and were broached during the conversations.

5.2.1. The way the object makes us feel

A number of the participants said that they were attached to some objects because of the "the way it made them feel" P04. For them, the object was not only a reminder of the story or the person behind it, but it also provided them with a sense of connection with their self-identity. One participant articulates this well - "I bought a T-shirt many years ago. I still wear it...it is not really comfortable to wear, the cloth is not really soft...but, I just love the message on it. It says 'stressed out' and a cat with its eyes popping out...I think it makes me feel like myself whenever I wear it. I feel as if I am expressing myself. That is why I still really like it." P01 uses a calculator that her brother gifted her whenever she "wants to feel smarter".

Quotes like these highlight how objects can associate a state of mind, emotion or behaviour. This suggests that objects have the potential to affect our moods and our

emotions. They become a means to express ourselves. Thus, aside from the story and the person behind the object, we start giving importance to our sensibility towards it too. This additional dimension related to our awareness arises either from our history of interaction behind it or because of its aesthetic appeal. For example, the calculator does not make P01 feel smarter because of its utility, but because her elder brother (whom she deems highly intelligent) gave it to her. On the other hand, even though there is a story behind the T-shirt that P04 is talking about, she affirms that it is the appearance of the shirt and the message it conveys that makes it so special for her.

This finding resonates with conclusions drawn by Kleine et. al. (Kleine et al., 1995) where they studied the types of objects people like and what reasons they give for their affinity towards them. Their study suggests that people tend to like some of their possessions because they "represent their self-image". From interviews, I can conclude that objects also help in self expression and make a statement about people's personalities.

5.2.2. Legacy

Many participants suggested the use of Phylactery to strengthen bonds between generations. They said that a technology like this would help reinforce the family history by establishing a permanent link to their legacy. With regard to this discussion, P03 said - "I think this is a valuable way to create legacy." The participants related this idea to family histories fairly effortlessly and asserted its value in generating legacy objects. Most of the participants in the study did not have a definite and comprehensive knowledge about their ancestry and did not own any heirlooms that descended from generations past their great-grandparents. Therefore, it was easy for the participants to relate to the scarcity in our knowledge about our lineage.

P05 said - "This would work wonders for connecting generations together. One thing I would do right away for mom - tell stories, about all her objects. I use that to leave things behind for my kids. I save objects for my kids. Change the temporality of the information – record something now for people who can't get it now." The participants also proposed using Phylactery to generate a few heirloom objects. P03 said – "It is a

great tool to generate legacies, but instead of waiting for the next generation and then passing down something to them, we can create immediate legacies in the form of gifts. Giving gifts to nephews and nieces on occasions like baptism or any other such thing would be nice." She indicated that even if we are not sure of our family history and passing down things to the future generations, we could still generate "immediate legacies" by giving each gift and recording our voices onto them.

One question that cropped up a number of times in the interviews was to decide which object would be turned into a heirloom object. Most of the participants falling under the category of young adults were quite unsure of what objects they would use for passing down to their successors. They worried about choosing things that they might not deem valuable at a later point in time. Also, they expressed that they could not talk about something without putting much thought into it. I also sensed some hesitation among most of the participants when they were asked to record their story about the object they brought.

P05 also saw this technology as a way to pass down some information to her kids, but at a later time. She said that this formed a good way of changing the temporality of the information because not everyone would be ready for the information now, but they would be at a later stage in life.

5.2.3. Pertaining to people rather than stories

We envisioned Phylactery to be used for augmenting physical objects with memories and stories from one's life. The desire to tag heirlooms (discussed in the previous section), travel souvenirs, other meaningful artefacts in the house, therefore, seem like credible utilization of this concept. However, I observed from the interviews that the participants gave more importance to objects that were related to a person close to them. Most of the objects we discussed were some form commemoration of another person behind it, not the personal history that the participants had with the object. P01 expressed her opinions regarding this - "I am a 'people' person more than an 'objects'

person. What I mean is that when I see an object, my brain somehow triggers the memory of the person behind it, not of the story of the object."

The participants had to choose one or two objects of emotional significance for the interviews and most of them picked artefacts with a "person" connection to them. I believe this observation leads to the conclusion that the most endeared objects to people tend to be things that prompt them to remember a person. In other words, these are objects that are in a sense an embodiment of another individual. The participants viewed the objects that they brought for the interviews as placeholders for that person who they had either lost or were physically separated from. I believe this observation provokes an interesting aspect related to this research and it should be addressed with further investigation.

5.2.4. Sharing the memories and stories

Unlike our conclusions from the study on Penseive Box, the participants were intent on sharing these memories with their friends and family. A lot of them saw Phylactery as a showpiece that they would keep in their living rooms. They also suggested that they would like their friends interact with it while they are visiting and listen to stories about the various artefacts around. They indicated that they also saw this as a conversational piece and they imagined sitting with it in the company of guests and reminiscing about old times, or playing with the objects to make stories, etc.

P07 said – "I would love to record my daughter's voice when she learns to say new things. I would use one of her toys to record that. And then, when our friends or family come over and they ask me about her, I can tell them to just place the toys on top of this and listen to her." P05 had some similar ideas about its use – "Imagine something like this on your dinner table where you can just interact with all the people around the table with these objects. Maybe even play." The willingness to share also surfaces from the examples discussed earlier – where the participant wanted to use this as leaving behind messages for her partner.

It is interesting to note that the above usage scenarios are decidedly similar to the projects, Cueb and 4photos discussed in the second chapter (Hoven, 2014; ten Bhömer et al., 2010). The researchers designed these concepts to facilitate interaction between families and friends. But, my participant pool perceived Phylactery to initiate and cultivate conversations. Being able to share this technology for interpersonal interactions was one of the most recurring usage scenarios that the participants proposed. Even though, it was not an original intention behind Phylactery, I believe that the most appropriate use of this technology would be to provide a way to form conversation in a family setting.

The above themes express the general opinions about the use of Phylactery. I think this concept offers some insight into the way we interact with objects and how technology can advance this interplay. From my analysis of the interviews, I conclude that attaching audio clips to objects serves various purposes – practical, recreational and commemorative. It also proves to be of significance in developing interpersonal relationships by providing a channel for communication.

5.3. Summary

In this chapter, I expanded upon the detailed results from my studies. I laid out my conclusions from the analysis on the interviews. I also described the course and evidence that led me to the interpretations that I formed. I present a concise and comprehensive conclusion in the next chapter.

Chapter 6. **Conclusion**

In this thesis, I have tried to address some of the questions pertaining to technology mediated memorialisation. I designed two systems that allowed the users to commemorate their relationships and memories through technology. I used these systems and concepts to conducted two ethnographic studies to address the the research questions discussed in previous chapters.

Penseive Box was useful in discerning that the concept of embodiment of a deceased loved one is an acceptable one. The significant issue that was raised in the study on this project was the agency provided to the users while developing the system. Since, the attention of Penseive Box is on the intimate nature of our relationships with someone who has passed away, it is important for the users to be able to preserve the personal memories in an intact manner. Therefore, they favoured the autonomy to include the memories they want, the way they are stored, the aesthetics of the box, etc. We contend that Penseive Box was successful in inspiring the idea of embodiment in people and has the potential to help people honour their friends and family that have passed away.

With Phylactery, I uncovered some interesting characteristics about our attachments with physical objects. Phylactery provides a means to use objects to communicate with technology and other human beings simultaneously. It utilizes inanimate things to arouse memories and a communication medium for families and friends. I believe that Phylactery is a compelling way to use objects for recreational and commemorative purposes.

Both of the projects – Penseive Box and Phylactery - promise different approaches linking physical world to the digital world. This bridge between the two aspects can also illustrate newer ways of communicating with technology and other beings. Both the projects also proved successful in inspiring the ideas of remembering

and preservation of histories. I believe my conclusions in this research can prove useful in building the existing literature in this field and provoking new directions for the future. The conclusions can also be useful in designing commemorative technologies and can guide some considerations for future products.

6.1. Future Work

I believe that we have a long way ahead of us in this area of research. There are still many unanswered questions and many unexplored concepts that can provide us with fruitful insights. Some of the questions that arise from my research are:

- How does the use of Penseive Box and Phylactery change with circumstances around a person's death? Do the memorialisation processes differ when it is an untimely death? Or a suicide? Accident?
- How can we address the issue of physical objects disintegrating? Would people be interested in preserving the objects through generations or do they want to save only the memories?
- How much is too much? Would people want to use different Penseive Boxes for different people? How many of the objects do they think they would attach stories to in their house?
- How can these idea help in educational and assistive technologies?

These are some of the questions that I believe can prove useful in developing a deeper understanding of tangible technology for remembrance purposes. Apart from the questions that this research raises, there are some areas that I could not explore here. I believe the perspectives on death and memorialisation can have different meanings for various cultures. Therefore, a detailed study on how different cultures think about these ideas would highlight interesting insights in this field. Memorialisation is a continuous process and therefore, a study prolonged study into the usage of these projects would be most effective in reaching substantive conclusions about people's practices (Friedman & Nathan, 2010). Another direction that the ideas of Penseive Box and Phylactery can be taken is towards hauntology (Davis, 2005). Hauntology explores the idea of technology that uses ghosts and haunting as a metaphor to implement ideas.

In this thesis, I explained a gap between the tangible and digital technologies pertaining to memories and memorialisation. I also discussed two design concepts addressing this gap and the inspirations behind them. I conducted ethnographic studies to elucidate people's perspectives about them. I also explain how the conclusions from my studies illustrate usefulness and raise some other interesting questions for future research.

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