"It's not just for the Past but it's for the Here and Now": Gift-Giver Perspectives on the Memory Machine to Gift Digital Memories

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We present the design of the Memory Machine (MeMa), a technology probe that can store, contextualise, and document media to represent memories. We accumulate vast physical and digital possessions throughout our lives, making it difficult to distinguish value in amassed images, albums, videos, mementos, and music. One option we wanted to explore via MeMa was to frame personal memories as a gift, in turn providing a way to revisit, share, and collate personal archives. We deployed MeMa into participants' homes and tasked them to create a digital gift involving an autobiographical memory. Through qualitative methods we uncovered the experience of twelve gift-givers. We found that the framing as a gift brought meaning to a collection of media, promoting reflection and emotional reminiscence in participants. Our contributions include design implications involving the relationship between emotions, technology, and gifting.

CCS Concepts: • **Human-centered computing → HCI theory, concepts and models**.

Additional Key Words and Phrases: memories, gifting, digital gifts, nostalgia, reminiscence

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1 INTRODUCTION

We continually capture, store, and document our lives via smartphones, resulting in extensive personal digital archives, with some capturing digital copies of physical objects for the ease of sharing. Both younger and older generations [77]

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now convert memories into digital possessions [46] and there has been growing interest and debate in human-computer interaction (HCI) communities, which deliberate what we do with accumulated data. Multiple studies [36, 48, 50–54, 69] in the field have focused on either creating physical artefacts and systems to present and store our personal media. Or, they discuss how technology can mediate reminiscence or nostalgic experiences. These works allude to the importance of personal connections elicited by sharing media, and in our study we aimed to develop this further by creating a technical solution to specifically explore re-purposing and re-framing memories as a gift.

Gifting is a ritual with both social and economic functions [16, 43, 44]. Gift exchanges extend to more than just the transaction of physical objects [6, 16, 55], and involve the transaction of relationships and emotions too. The gifting phenomenon is widely researched in multiple fields, yet only few examples within HCI propose new modalities of gifting both physical and digital objects [39, 41, 68]. This study aims to build on these works and contribute to ways of gifting our media to represent memories.

The aim of the Memory Machine (MeMa) was to build on the prior work of [58], where the idea of developing a device to capture personal recollections was explored via a series of workshops. In this paper, we expand on the process of creating a technology probe [33] that could be used to store, contextualise, and document memories with the aim of gifting in mind. The MeMa probe was a tablet application that enabled participants to import their autobiographical media-memories using public and personal images, videos, text, and voice. We define media-memories as re-purposing amassed media (either physical or digital) to construct a representation of a past time or lived experience. We derive this definition from HCI works that outline the roles of media in memory recall [12, 72, 73]. We tasked our 12 participants from two groups (older adults and families) who may be frequent gift-givers/receivers to independently and asynchronously create a gift using MeMa. The aim was to uncover in-depth knowledge solely from a gift-giver perspective on how the MeMa probe may facilitate the creation of media-memories, the types of memories that were classed as a 'gift' and why, and who they envisaged gifting these memories to. We further explored any subsequent roles of the MeMa probe in supporting reminiscence or nostalgia.

In this paper we firstly set out related works which underpinned our study, we then discuss the iterative process of creating and designing MeMa. Further, we then present our methodology and ethical considerations. Within the findings we discuss the main themes identified from thematic analysis of 2 focus groups and 3 interviews with 12 participants in total. Notable findings include how gift-givers used media creatively to form a gift, the mixture of emotions and reflections participants experienced, and differing motivations for selecting a memory including: legacy, storytelling, and preservation. Lastly, we discuss the design implications of this work and summarise our main contributions which we believe are as follows: (1) new knowledge on technology supporting gifting practices including design implications. (2) In depth understanding of gift-giver emotional and practical experiences of framing their memories as a gift. Lastly, (3) an illustration to demonstrate key components involved in transforming memories into gifts, which we hope promotes reflection on the design of similar works involving gifting, technology, and emotion.

2 BACKGROUND

Within this section we discuss the relevant theories and arguments that helped to underpin and structure the direction of this work. We begin by outlining related work involving technologies that support the capture, storing, and revisiting of memories. In the final half of the review we explore gifting, specifically focusing on the place of possessions within exchanges.

2.1 Memory and technologies

In a cognitive sense, memory is a way of storing and retrieving information which has been acquired through one's personal senses [5]. Types of memory include episodic and semantic, with the former being associated to lived experiences, and the latter relating to knowledge about the world [71]. For example, an episodic memory could be your child's birthday party, and a semantic memory would be the date of your child's birthday. Autobiographical memories relate to both factual knowledge and personal history, thus they are associated with both episodic and semantic recollections [18]. The accuracy of autobiographical memories can vary, with some memories involving errors or distortions [18]. Despite inaccuracies, meaningful autobiographical memories can serve social functions such as teaching to give advice, promoting intimacy or closeness in relationships, and empathy to reassure others [2].

A key element of memories is with whom we experience them with, therefore a lot of memories become interpersonal, resulting in social sharing of a past time and emotion [59]. On the other hand, we may want to share memories with people who were not present at the time to tell a story and reinforce self-identity [83]. Though we cannot transfer our memories or experiences, we have a desire to communicate and share our memories with others [31].

Typically, recollection of lived experiences promotes nostalgia [29] or reminiscence [82], which prior to the ubiquity of smart phones would have been experienced through physical photo albums or mementos. Nostalgic emotions have many definitions, but for this work we recognise the bittersweet feeling that can involve a range of emotions such as loss, joy, and regret [8, 79, 82]. On the other hand, reminiscence is not associated with a specific emotion [29]. Both reminiscence and nostalgia can be associated with physical and digital possessions [34, 47, 48, 69]. Due to ease of capture we accumulate new personal data everyday via images, videos, emails, and messages on a variety of different devices [45]. We also render physical objects digital via taking photographs of possessions, thus making the management of virtual possessions challenging [76].

As our digital interactions and repositories continue to increase, the ways in which we use media to support close interpersonal relationships is continually evolving. It's commonplace for families, couples, and older adults to use technologies to maintain relationships through digital communication [30] for example, sharing media (photos, videos, voice notes, social media posts) via smart phones. From an HCI perspective, various technologies have been developed and explored to uncover ways relationships can be enhanced, supported, or facilitated via media. One example investigated relationships between grandparents and grandchildren [75], the study involved sharing images and text messages. Findings demonstrated how intergenerational media sharing encouraged playful interactions as opposed to serving a communicative purpose. Similarly, one study explored technologies and parent-child relationships, with discussions outlining the importance of video communication via multiple channels and modalities to increase a stronger sense of social presence when families live apart [65]. Relating to geographical boundaries, cultural themes also refer to digital media usage in relationships. One ethnographic example [81] uncovered how emotions can translate through digital media within transnational families. The findings demonstrated how digital devices are 'routinised' and are part of everyday rituals of staying in touch. On the other hand, the authors note that not just positive emotions can translate with guilt and obligation being factors to consider. Overall, digital repositories and media are deeply routed in societies and are key to sustaining relational connections, yet knowledge on gifting emotions via media remains limited.

Multiple works [27, 28, 62] within HCI focus on the concept of "life-logging" which is the act of capturing an individual's experiences through technology, although in some cases the volume of captured content makes it difficult to categorise, reflect upon, and organise memories. Despite the evident challenges of maintaining and interacting with

our increasing digital archives, researchers within HCI [3, 19, 40, 48, 50, 52, 69] have been designing technologies that promote reminiscence, nostalgia, or reflection through both autobiographical and cultural data.

Popular media types to support emotional recall range from personal and public images, videos, music, voice notes, news excerpts, and past social media posts [9, 46, 48, 52, 69]. Further, the role of media being a tool to construct memories is an area of interest within HCI [12, 72, 73]. These works discuss how technology could be used to store media as memory cues for past events, but argue that augmented memory systems can not store memories [73]. Whilst there would be difficulty in capturing wholly accurate accounts of lived experiences, works point to technology mediated reflection as a way to build repositories for selective reminiscence [60]. The value of selectively capturing and documenting lives through media includes re-living of memories, social recollection, and reinforcement of self-identity [63]. All of which has contributed to emotional attachment to digital possessions [59].

One example by Odom et al. [50] focused on creating three devices to capture 'technology heirlooms' with the aim to uncover how such devices may support the inheritance of valuable digital images across generations. Findings revealed differences of perceived value between digital and physical objects, highlighting how participants desired to display and interact with digital materials, aligning with findings of [49]. In more recent work [52], Odom et al. presented a study involving a music player to engage and remind participants of previous music listening history. Through findings, the study demonstrated re-experiencing data can promote rich reminiscence, and called for future research to investigate new technologies facilitating everyday experiences.

2.2 Gifting and possessions

Gifting is based on transactions, extending to the exchange of both relationships and objects [11, 44]. The process of creating a gift can involve rituals of searching, purchasing, crafting, and wrapping [41]. Gifts can be giver-centric or recipient-centric depending on what the gift reflects [1], with givers tending to consider elements of thoughtfulness, effort, and generosity when contemplating a gift [22]. The exchange of gifts further presents an opportunity to impact or transform social relationship meaning, with impacts ranging from strengthen, affirm, attenuate, and sever [64].

The exchange of memory or contribution to someone else's memory is underpinned by the idea of transactive memory systems [56]. However, knowledge on social exchanges of autobiographical memories remains limited. Due to advances in technology, gifting rituals now include both physical and digital modalities such as online gift vouchers. Despite our growing digital archives, digital gifting remains underexplored [13] with a lack of consideration on re-purposing personal memories as a gift. Multiple studies [20, 21, 34, 57] discuss the perceived value or benefits of digital possessions, although the same view is not always true of digital gifts which can lack ownership and visible effort e.g. no time spent wrapping a gift [4, 41]. Despite being a convenient approach to sending and receiving a gift [37], there are arguments that digital content is only shared as opposed to gifted [10, 24, 25]. However, Spence proposes that both physical and digital objects can inherit a sense of the person who gave the object [67], therefore, increasing its value.

In psychology, connections between possessions (physical, digital, or hybrid) and memories are discussed by van den Hoven et al. [74]. The authors outline four connection types, for example one type entitled "memories expressed through possessions" relates to objects as memory cues. Personal photographs would be a common example of this connection type, however, the authors highlight how digital versions of possessions may impact the association between memory and object, with it being more difficult to form attachments due to lacking physical material.

From a marketing perspective, digital goods can become more meaningful via deliberate acts of sharing and gifting [20, 21], with it being possible for digital objects to promote inalienable feelings [67] (where objects inherit a sense of the person who gave it [78]). Yet, we rarely see examples of this within HCI works which tend to focus more on the

framing of legacy or 'passing on', as opposed to gifting. For example, Gulotta et al. [26], discussed findings from a study of interviews exploring technology probes to understand passing on digital materials to others. Results highlighted the difficulty participants found in being selective with memories and suggested that systems should be designed to enable distribution and sharing of memories to loved ones. One option to address this challenge could be to explore the gifting phenomenon in relation to giving people parts of our digital archives.

Through previous work, we recognise the research gap relating to memories, media, and gifting. Specifically, it's unclear if and how media-memories could be gifted and how re-experiencing memories as a gift-giver could emotionally impact participants and perhaps what type of reminiscence or nostalgic feelings it may promote. Further, it's clear that various familial relationships use digital technologies and media to communicate and sustain their relationships, yet it's uncertain if gifting could assist certain groups like families or older adults with these acts. Therefore, in this study we aim to uncover new knowledge on what types of memories are selected to gift, the media used, and an in-depth understanding of how a technology probe like MeMa might support gifting practices from a gift-giver perspective.

3 CREATING MEMA

The reviewed literature presented an opportunity to design a new technology probe which could be used to specifically explore research gaps relating to gifting media representations of memories. In this section, we elaborate on the look and feel of MeMa. Importantly, it should be noted that we started designing a dedicated physical machine to house both hardware and software, however, due to Covid-19 restrictions we reverted to a software-only solution (i.e., application version via touch screen tablet).

Based on the work of [58], we were initially influenced by the design of popular children's toys which have a simple and bold design and utilise large buttons and dials. The incorporation of elements such as a large screen to view memories, a microphone to record audio, and buttons to record and view memories were deemed to be important elements of the MeMa. We felt this was important due to wanting to encourage physical interactions and a simple design that would lend itself to a wide range of participants with varying degrees of digital literacy (see Figure 1 for initial sketches).

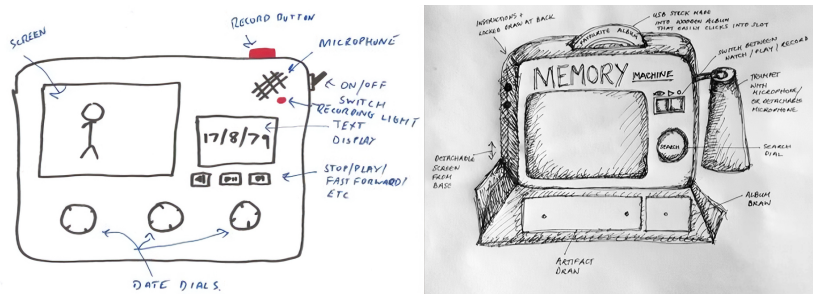

Fig. 1. Early design sketches of MeMa

Due to the Covid-19 pandemic we turned our attention to the software only solution. The aim of the application was to explore the conceptualisation of MeMa within people's homes. To begin this process, our artist researcher carried out a prototyping session with a potential end user who was an elderly member of their family, this was due to Covid restrictions which limited our access to other potential end users.

The aim of this prototyping session was to rehearse how the MeMa might work in practice. The researcher used presentation software to set out media and memories (see Figure 2). The family member started with a 'linchpin', an initial photograph to act as a starting point, and then searched for other media to support this memory. This exercise triggered a searching activity for relevant opera music and newspaper articles. The researcher discussed with their family member how these memories could be revisited once they had been created. Options included how images could be clicked on and expanded to show details or how icons could be created to play sounds. This lead to contemplation on the difference between creating a memory, experiencing it, and playing it back through the MeMa interface.

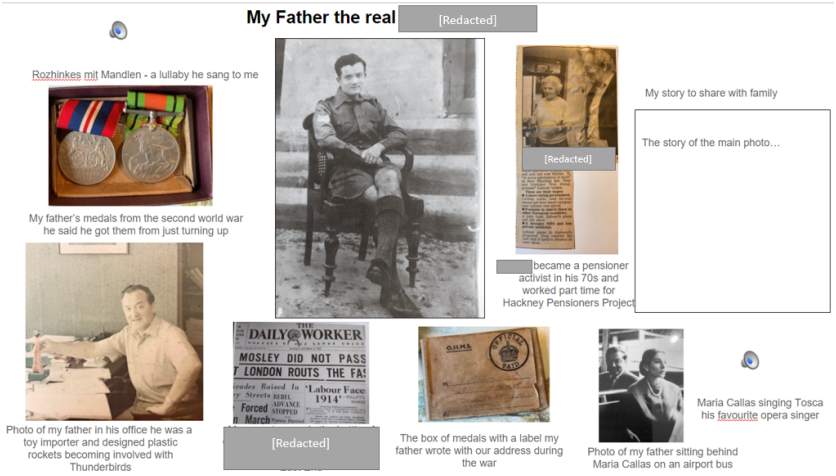

Fig. 2. MeMa user testing

Previous research and the user testing helped to inform and shape the design of MeMa in four key ways. Firstly, the idea of a 'linchpin' or cue for a memory could help with selecting a set of related media. Based on this, when we deployed the MeMa technology probe, we suggested in the accompanying instruction manual that participants think of a memory from childhood as a starting point.

Secondly, the concept of a collage of memories was added to the design. A collage combines memories together across time and finds undefined links between memories. For example, the researcher's family member had memories from different time periods triggered by hearing a lullaby. We therefore added the 'collage' option to the prototype.

Thirdly, the way in which the family member used a combination of voice recordings and text to narrate the memory. They discussed how the voice recordings might only be gifted to their granddaughter whereas the text narratives were less personal and they were happy for them to be viewed by anyone. We further noted that access to music and sound also had a profound and emotional effect which reinforced the importance of the MeMa capturing sound recordings.

Lastly, the user testing demonstrated a need to move between the creation of the memory and the playing of the memory. This helped us design the prototype interactions. To build upon the user testing, we used an iterative design process. We started with sketches based on findings from [58]. Initial interface designs were created by our researcher artist (see Figure 3) and our final design scheme and palette can be seen in Figure 4.

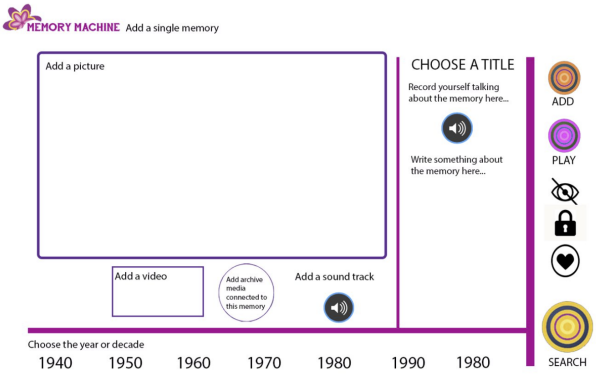

Fig. 3. Iteration of MeMa interface design

Fig. 4. MeMa design scheme

Researchers agreed on features and functionality of the application. Our research artist and developers then worked on creating the final interface (see Figure 5). After the application was developed, we downloaded it to five Android tablets for use within participants' homes. We ensured all tablets were in kiosk mode, where only the MeMa application was accessible. We also created an instruction manual to help participants with using features of the MeMa and describe asynchronous focus group tasks. The tablet and manual can be viewed in Figure 5A.

On first use of MeMa, a message appeared to show that no memories had been created and stored within the device yet, a button prompted users to start adding memories (see Figure 5B). Within MeMa, users had a choice of four media types to capture and view: images, videos, notes, and audio (see Figure 5C), as per similar technology probe studies which combine various media types [3, 19, 48, 50, 52, 69]. To commit images or video to MeMa, users could use the built-in tablet camera (see Figure 5D).

The MeMa aimed to be more than a repository for storing media. The concept enabled users to add their narrative to autobiographical memories through a variety of media types. Thus, the functionality to import media from other sources such as social media and external storage was deliberately left out, although participants could take images of digital possessions using the camera. We also felt there were numerous technical and ethical considerations of the MeMa being 'online' and in this instance we wanted to explore an offline solution, where media has to be manually captured

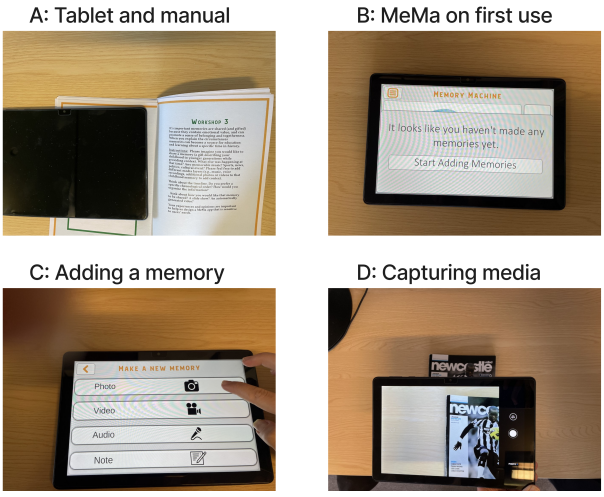

Fig. 5. Interactions with MeMa including how media was captured

instead of 'uploading'. Therefore, we wanted to retain a sense of the MeMa being standalone and not connected to multiple devices or systems.

Participants had the choice to create 'Album Pages' or 'Collages'. Album Pages enabled participants to display stored images, videos, audio, and notes together on a single page (see Figure 6G for a blank example of an album page), including the functionality to date individual media (see Figure 6E), and the ability to name an Album Page (see Figure 6H for an example album page along with a name for the memory).

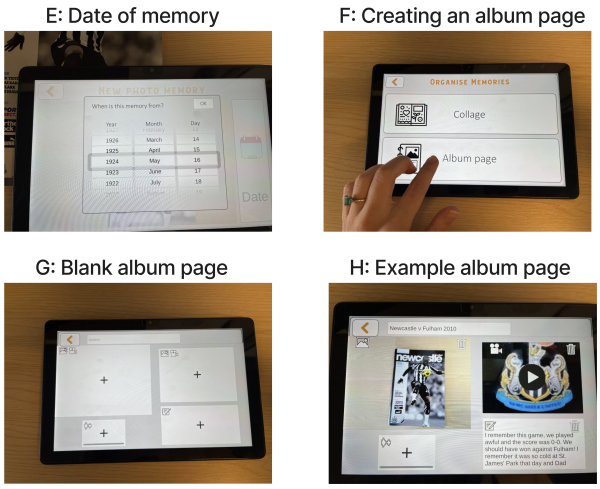

Fig. 6. Interactions with MeMa including how Album Pages could be created

Collages could be used to display a range of memories from different time periods, giving autonomy to the user to select various media types (see Figures 7I and J). Memories could be further viewed and organised via Collections (see

Figure 7L) which could group memories created as Album Pages or Collages. Once two or more memories had been committed, they could be viewed within a Slideshow mode (see Figure 7M) where stored media would automatically play in a loop. Media could be deleted by selecting the delete button (see Figure 7N).

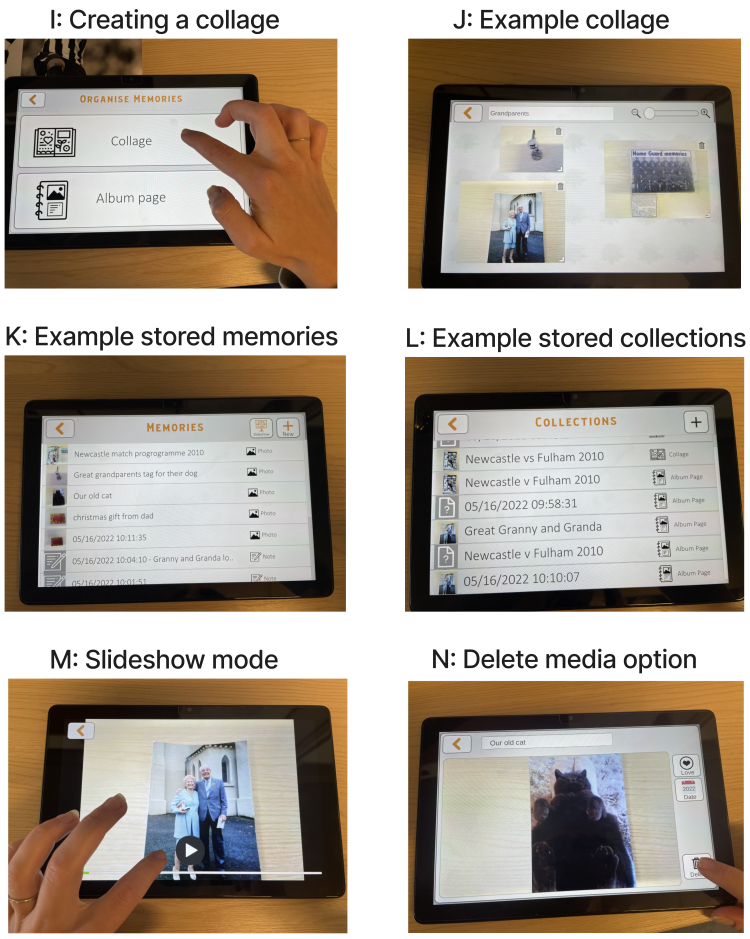

Fig. 7. Interactions with MeMa including how Collages could be created

4 METHOD

This section presents the approach for exploring the MeMa probe which was deployed in each participant's home. One week prior to the Gifting focus group, participants were tasked with asynchronously creating a gift using MeMa. For transparency, two further focus groups were held with these participants relating to Usability and Privacy however the focus of this paper will be on the data solely from the Gifting focus groups.

4.1 Participants

In total for the focus groups, we recruited twelve participants, including two sets of cohabiting couples. Focus groups were divided into two groups as we aimed to capture a range of users at different life stages. The groups were older adults, and families (those with young children or young adults close to their family whom they would be inclined to share memories with). To clarify, participants in the family group were not related; they were individual users from different families. Our justification for the older adult group is that this population is at higher risk of memory loss and cognitive decline (i.e., dementia) although we view MeMa as a reflective or learning tool as opposed to a 'therapeutic' one. This contributes to discourse within HCI of designing for the ageing population aside from accessibility purposes [38]. On the other hand, families were chosen to explore the dynamics of a more complex setting and to understand if MeMa can be used as a tool for promoting digital gifting within younger populations. Participants in the older adult group ranged from ages 61-74, with most being familiar with technology and owning a smartphone, however some noted they did not use their phone every day and may require a small amount of assistance when completing tasks. The family group ranged in ages from 30-54, where all stated they use smartphones and other devices so they are comfortable with using technology.

Table 1. Overview of focus group and participants

Participant ID (focus group/interview)	Group
1 (1)	Older adults
2 (1)	Older adults
3 (1)	Older adults
4A (1)	Older adults
4B (1)	Older adults
5A (1)	Older adults
5B (1)	Older adults
6 (2)	Family
7 (3)	Family
8 (4)	Family
9 (5)	Family
10 (5)	Family

Each focus group lasted on average for 1 hour and 28 minutes, with each participant having a period of one week to create a gift. An overview of participants can be seen in Table 1. All seven of the older adult group were able to attend the focus group at the same time. Due to time constraints and availability it was more challenging to replicate this with the family group. This resulted in the focus groups being adapted to take an interview format, with three individual interviews taking place and a final session with two participants able to attend at the same time.

We recruited participants in the local area to the University (for ease of tablet delivery), through University newsletter call-out and by asking neighbours of the research team and in some cases participants asked others they knew if they would be interested in the study. Participants who agreed to take part were directed to an online consent form where they could learn more about the research project via an information sheet, prior to consenting. There was an opportunity to speak with members of the research team to learn more about the project if required. After they completed their consent, they were immediately directed to a contact information and demographic form. Each participant received vouchers as compensation for taking part in the study with a value of £60, which were delivered to participants after the MeMa tablet had been collected.

4.2 Data collection and analysis

Before focus groups and interviews took place, each participant was provided with a tablet to use within their home alongside a physical copy of an instruction manual. The manual included details on how to use the application, such as how to add a memory, viewing memories in a slideshow, creating a collage, frequently asked questions to help with any technical issues, and provided space for any notes participants wanted to make during the study. The manual also described the gifting activity they were expected to carry out which promoted participants to think back to childhood or prominent memories and how or if they would like to gift these to younger generations, thinking about what media to use and other events that happened in the same time period.

We aimed to capture a discussion around the topic of gifting, thus the focus group dynamic would assist in gathering viewpoints, provide an opportunity for collaborative deliberation, and the sharing of perspectives on a common issue [23, 35, 66]. Further, Lazar et al. [42] comments on how focus groups allow for interactive elements via demonstration. In this case, we asked participants to show and discuss the media they had selected to gift and why. We believe that semi-structured focus groups were an appropriate method. In those cases when we had to adapt to an interview method, we still provided each participant with a chance to discuss what memory they wanted to gift, why they wanted to gift it, and who they envisaged gifting this to.

Focus groups were carried out online with at least two members of the research team present. One acted as the main facilitator, while the other assisted with technical needs. Sessions started with reminders about ethics e.g. reminding of rights to withdraw and gaining verbal assent for their presence. A focus group guide was followed which included a discussion on how gift-givers would like to make their recipient feel when receiving a gifted memory and explicitly asked about nostalgia to explore any positive and negative emotions associated with creating this type of gift, as per the approach of [32, 82]. Questions ranged from 'Do you think gifting could shape how you would like to be remembered?', 'How well can MeMa tell and share stories?', and 'Do you think your memories would be of interest to other people? and if so who?'.

Once all focus groups were completed, the automatically generated transcripts were cleaned and anonymised. We then began an inductive thematic analysis process following a reflexive approach as outlined by Braun and Clarke [14, 15, 17]. The reflexive approach helped the researcher who studied the transcripts and generated initial data codes to recognise their starting point and beliefs that could potentially impact the findings: they have a background in technology, they are a person who sends and receives gifts often, they like to reflect and look back on their own memories, and they were involved in the development of MeMa with experience of using the application. Initial themes were then grouped and re-grouped iteratively, involving the wider research team who reviewed generated themes for agreement.

4.3 Ethical considerations

This work gained full ethical approval from the University's ethical approval board. Participants were informed on how their data, including mixed personal data, would be used and anonymised. As participants would be using a tablet in their homes and uploading their personal data (images, videos, audio, text), we ensured that all tablets were wiped after use, but beforehand participants were sent a copy of any data so that they could retain their notes and memories. We did not store or keep any uploaded data from this study. We also had a member of the research team with a background in law read through the privacy statement and ensure it was easy to understand and added this to our consent forms. Additionally, we added signposting information to the information sheets for anyone who might have been affected, including relevant charities e.g. Alzheimers Society and The Samaritans.

5 FINDINGS

In this section, we present findings from reflexive thematic analysis. Three themes were generated from the analysis process, with sub-themes relating to each. Our themes are: considerations of using media to represent memories, outcomes and reflections on using MeMa to create a gift, and finally, practicalities of gifting memories (see Figure 8 for an overview of themes and sub-themes). An overview of memories that participants decided to gift can be seen in Table 2. The table presents a written description of each memory selected by participants, to whom they could envisage gifting this to, and the media they used to represent the memory. Predominately, memories involved family members, friends, events, culture, and memories relating to those who have passed away. We note that co-located pairs of participants decided to present just one memory jointly instead of one memory each.

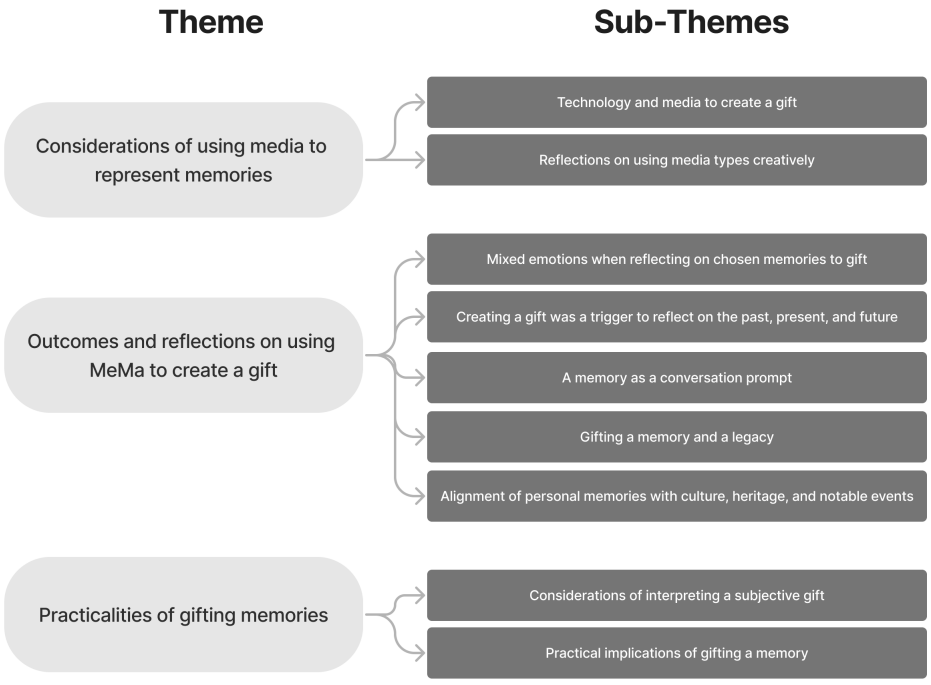

Fig. 8. Overview of themes and sub-themes

Table 2. Overview of memories to gift

Memories selected to gift	Anticipated recipient	Media
Memories of their Father who died young, such as music he liked and what happened the year he died (moon landing).	Children and grandchildren	Video, music, text
Memory of their father playing a practical joke on them as a child.	Grandchildren	Image of themselves as a child
Social commentary of the 1970s/1980s, such as price of things, the fashion, music.	Friends	Photographs and music
Childhood holiday memories with their family.	Children	Image of a tent, car, and a poem.
Childhood memories, school days, and holidays.	Children	Text notes
Memories for their children of when and before they were born to show more about who their mother was before she had them.	Children	Images
Event of an earthquake in the country they are from and generally memories from the past 10-15 years.	Children and husband	Voice recording and music
Image of father-in-law who had recently passed away, an image they had originally been gifting themselves.	Children and future generations	Photograph
General memories and life experiences (going to nightclubs).	Child	Voice and images
Memories of childhood about their Mother.	Future children	Voice, images of Mum, video

5.1 Considerations of using media to represent memories

This theme was identified due to participants elaborating on their experience of curating, re-experiencing, and searching for media to form their gifts. We split this theme into two sub-themes of: technology and media to create a gift, and reflections on using media types creatively.

Technology and media to create a gift: Participants (1, 2, 4A, 4B, 8) generally noted how technology can help with sharing media as gifts for loved ones. Participant 4A expands: *"So, if I hadn't been able to do that digitally. I wouldn't have been able to share the photos with them"*. Participants 2 and 8 shared a similar view: *"[...] in order for me to share it as we do these days, you have to share it electronically. So I took a photo of it"* (8). Other participants noted the practical advantages of transferring large quantities of memories between families who are geographically far apart. Additionally, Participant 1 mentions how digital images can be edited and copied: *"of course, what they [grandchildren/family] can do. Is they can hone in on me and make me bigger in the picture then cut and paste [...] which they wouldn't be able to do with the picture in out of an album"*

Participants 7 and 9 discussed that while digital memories can be a permanent record, they also note how emotions and life lessons from these memories can also be gifted. Participant 7 adds: *"it changes the way that I think about life [...] to pass on to my children because, you know, maybe they can learn that such things [...]"*, and Participant 9 stating: *"There's that sense of, what's that word? in solidarity and a shared experience"*. Overall, this sub-theme contributes to new understanding, advantages, and emotional impacts when using media and technology to create gifts involving a memory.

Reflections on using media types creatively: All of the participants mentioned the use of media to capture and document their lived experiences. Specifically, 3, 4B, 6, and 7 all mentioned the powerful use of music, with Participant

7 adding: *"[..] music is definitely something that brings memory back[...].* Participant 4B elaborates: *"Songs like King of the Road, Frank Ifield songs were played [. . .] so it's just to give us sort of like an impression of the 50s[...] you know, anything nostalgic, for the children"*. In particular, within the older adult focus group when participants decided to play a song from their MeMa it sparked joy and conversation amongst the group.

We also note how participants (1, 2, 5B, 6, 7, 8, 9, 10) discussed the different media types they used and why, with Participant 9 discussing: *"I think that's why pictures are so important. Because you can see faces and expressions and the context of body language. You can evoke emotion"*. Similarly, Participant 6 states: *"I look at each picture. I remember the nights out [...] I think that for me that works very well. More than audio because videos you have to go and play it"*. Lastly, Participant 7 mentions: *"[..] you can have music and voiceover and different layers. So, that's probably more dynamic"*.

Participants felt that creating a gift using MeMa was a creative activity, and one which helped in being selective with media and memories (4B, 3, 9, 7, 1, 8). 4B elaborates: *"We're actually being creative. It's not just for the past but it's for the here and now [...] we're all being creative which [...] I mean, we're all writing a book, aren't we?"*. Further, Participant 9 mentioned: *"[...] creating a narrative, I think that you've got the options for voice clips, but actually pulling it all together for the person to talk about it would be a really amazing feature"*. Participant 1 further discusses how gifting memories from MeMa could help with being selective with media and memories: *"I can see the merit in small items and building on it over time rather than just simply going into a long diary of this happened this year [...]"*. In brief, this sub-theme outlines how the use of overlaying media like music and text can be used creatively to tell a story.

5.2 Outcomes and reflections on using MeMa to create a gift

This theme was generated from the analysis due to participants reflecting on both their memories and experience of using MeMa to create a gift. We note in the older adults group there were evident joint reflections on the past with a sense of missing and longer for old times. We divide this theme into five sub-themes which focus on: mixed emotions, wider reflections, conversation prompts, legacy, and alignment of memories with notable events.

Mixed emotions when reflecting on chosen memories to gift: Within the focus groups and interviews participants expanded on emotions they felt whilst creating their gift, and how they would want a recipient to feel if they were gifted the memory. This includes, elements of sadness and loss when participants discussed loved ones who have passed away (2, 4A, 4B, 5B, 8). Participant 4A elaborates: *"[...] both of my parents died when I was very young.[...] it would be wonderful if now I could pick up a tablet [...] that showed me what sort of person she [mother] was, what she enjoyed doing, how she met my father [...] I would feel that it was a huge gift"*. Whilst Participant 2 discussed a bittersweet memory with their father: *" [...] it just made me laugh [..] then when I think back now and unfortunately my dad died when I was 26 and I'm really really missing [him] still. And that was like over 40 years ago"*. Participant 8 adds: *"[...] now that he's [father-in-law] no longer with us, it's even a greater gift, really, because it's a true memory of someone who's no longer"*.

Participants (7, 8, 10) also discussed how they would hope to make a recipient feel from their gifted memory. Participant 10 discussed how they hoped it could convey effort and time spent creating an emotional gift. Whereas, Participant 7 wanted this to be an encouraging gift: *"[...] just encourage them to think in a more positive way about their life"*. Lastly, Participant 8 wanted their selected memory to bring happiness to their children: *"I think that would bring a lot of joy [...] and a lot of giggles"*. This sub-theme demonstrates that selecting a memory evoked bittersweet emotions but also anticipation of how givers would hope to make a recipient feel.

Creating a gift was a trigger to reflect on the past, present, and future: Creating a gift using MeMa triggered wider reflections on life experiences and the self. Some participants from the older adults focus group (3, 4B, 5B) specifically mentioned how this was a trigger to reflect on other memories. Participant 5B adds: *"one memory can lead*

to a whole lot of memories and in turn lead to another [...]". Participant 3 also states how creating a gift promoted wider reflection on experiences with their friends: *"it evoked lots of memories and thoughts that then a lot of our memories came from photographs"*.

Further, participants (3, 4A, 8) mentioned how creating a gift gave them the time to reflect on their life, with Participant 8 elaborating: *"We could make that time but of course we don't. So as a gift it makes you stop and come and do it"*. Participant 3 added: *"I was nostalgic when I was looking back on things [...]. It's making me, you know happy about just looking back and sharing in myself the memories"*. On the other hand, Participant 4A provides an alternative viewpoint, where they felt like in later years these documented memories could help them: *"[...] for dementia or Alzheimer's [...] it could be helpful to keep my memories alive"*. Therefore, this sub-theme highlights how the act of creating a gift can include a reflective activity as opposed to traditional modes of gifting that focus more on purchasing or searching.

A memory as a conversation prompt: Some participants (3, 6, 8, 9 , 10) noted how they wanted to gift specific memories in order to revisit a past time with others, Participant 3 states: *"I was thinking the memories I'd like to share [..] with my friends"*. Similarly, Participant 9 mentioned potential outcomes of gifting memories to their child: *"It's an opportunity for us to connect with the past in the present"*. This sentiment was shared by Participant 8, *"I like to go back [...] because I want to share it with people"*.

Gifting memories was viewed as way to promote conversations between people (1, 3, 5A, 6, 8). For example, Participant 6 mentioned that curating memories on MeMa could be a joint activity between people. Participant 1 elaborated on how receiving an image from a family member promoted conversations, *"[...] this picture came to me from my sister [...] we all got it and all made comment [...]."*. Participant 8 further discussed conversations around the memory and media they had chosen as a gift: *"[...] my father-in-law gave me the photo [...] this also opened up a lot of conversations about other things [..], the topic of the war [...] but also music"*.

Lastly, the concept of gifting memories was also viewed as a way to open up about potentially sensitive or sad memories (1, 3, 6, 8). For example, Participant 3 stated: *"Like my Dad died when he was young [...] but I think by capturing them as a gift it gives then somebody chance to deal with that in their own way"*. Participant 1 felt that gifting via MeMa was a good way to bring up rarely discussed topics or people: *"My father died in 1969.[...] the gift is to our children because they never met him [...] So we don't talk about him [...] so this [MeMa] is a good discipline to bring back that memory"*. On the other hand, Participant 6 adds: *"some families already open and share all that anyway, so sharing a memory might just be a reminder of something they already know"*. Finally, Participant 8 felt that gifts were a good way to discuss lived experiences, *"We're not hiding things, we just don't talk about everything"*.

Gifting a memory and a legacy: Motivation for selecting specific memories ranged from wanting to preserve the past to passing on a legacy. Participant 2 felt this type of gift could be used to keep their father alive: *"[...] they [children] didn't really know him that well. [...] But then I like to talk about him to [...] keep the memory of him"*. Other participants (4A, 5A, 6, 7, 8) felt that gifting could contribute to family legacy, with 6 expanding: *"I want memories for my children. [...] But mainly my family, my husband.* On the other hand, 5A reflected on how they feel a responsibility to gift memories: *"I think important for me, to pass things on because I'm an only child now, [...]"*. Participant 4A discussed how they would like to leave a legacy of their memories: *"I haven't got that from my mother, father, et cetera, so I'd like to do that for my children and for my grandchildren"*.

Finally, participants (1, 5B, 7, 8) felt that gifting memories could help preserve the past. Particiapnt 7 reflected: *"so it made me think about, well maybe I should be recording more"*. Similarly, Participant 1 mentioned how they would like to preserve the past for their grandchildren who would be able to have stories passed down to them if documented

accordingly. Participant 8 mentioned how preserving the past and their memories could enable their children to feel nostalgic and *"take them back"*.

Alignment of personal memories with culture, heritage, and notable events: Mainly in the older adults focus group, participants (2, 3, 5B) tended to draw comparisons from past times to the present day. Participant 2 reminisced on a memory from their childhood when their father left a cardboard box out, *"in those days you never saw boxes or anything like you know [...] it was quite unusual to see a box [...]"* and further reflected *"which in them days you went out to play with your friends and it was quite nice"*. Participant 3 reflected generally on how things have changed: *"It wasn't that long ago, but how things have massively changed. [...] comparing it to probably nowadays, so a lot simpler times"*.

Participants (3, 4B, 7, 9 , 10) felt like gifting via MeMa could be a way to record factual information regarding their heritage. Participant 10 elaborated on traditions from their home country they could gift to friends, *"I can maybe for example in [home country] we have just special dance like traditional dance"*. Whereas, Participant 4B opted to include in their gift an image of an old car their parents used to drive and noted the transistor radio they listened to. An alternative viewpoint was offered by Participant 9 who stated: *"[...] if it would be possible to not just gift one's memory machine as a legacy to one's family, but also to like the British Library [...] to actually build up a body of cultural and social data"*.

Finally, we observed through chosen gifts that participants (1, 2, 3, 8) tried to align their personal memories with world events of that time. Participant 2 adds, *"Elvis Presley was number one record that year [...] the US entered the Vietnam War [...] while all that was going on, my memory that year was when I got up one morning and there was a box in the hallway"*. Similarly, Participant 3 mentioned *" [...] the first million pound footballer was Trevor Francis who went to [football team]. The average house price was £22,000"*. Participant 1 reflected on the image of astronauts they had decided to gift and how this related to their father's death: *"[...] a picture of the astronauts cause [...] my dad died in January and in July they landed on the moon in 69"*. Despite reminiscing on memories often resulting in comparisons and recall, this sub-theme uncovers how gift creation was the starting point which subsequently led to wider reflections.

5.3 Practicalities of gifting memories

This final theme was generated due to participants raising both ideas and limitations of gifting via MeMa, therefore we present two sub-themes: considerations of interpreting a subjective gift, and practical implication of gifting a memory.

Considerations of interpreting a subjective gift: Participants (1, 4B, 9) felt that it could be difficult for some people to accurately recall memories to gift, with Participant 4B adding: *"Some people have a more accurate memory than other people [...] you also gotta realise some people can express themselves better than other people"*. A similar sentiment was shared by Participant 1, *"[...] we actually remember things wholly different from what actually happened at the time [...] So it's quite normal that we changed the story to suit our storytelling as opposed to being detailed"*.

A further point of how or if we should gift sad memories was raised by some participants (1, 6, 8), with Participant 8 elaborating: *"[...] I don't want to put it down permanently, a negative memory. That's my initial feeling [...] well, they [children] could learn from it, [...] all depends on how you interpret negative memory"* . Participant 6 further adds, *"You know that's just nature of it. But if you give something as a gift, well yeah it has to be happy. But who would want to give a sad memory"*.

Participants (1, 3, 8, 6) also noted how gifts are subjective and it depends on the person. Participant 1 comments: *"[. . .] you can't set it up and then say it's a gift and then make sure it is a gift. It's up to them [recipient] to accept it as a gift isn't it?"*. Participants 8 further mentions,*"The viewer has a choice [...] they could just turn it off"*, and similarly Participant 6 states: *"[...] for people you don't see often, it could be a nice gift [...], but it just depends how you interpret gifts and who it is for I guess"*. Participants 9 and 10 perhaps allude to a way to counteract this subjectivity by involving something

physical, or by gifting an entire memory machine. Participant 10 expands: *"Parents or just relatives. Maybe I can just give them the memory machine [...] I mean because if you touch it you can feel it and then it's gonna just make a connection [...]"*, and Participant 9 comments:*"it would be really lovely to have a beautiful object. You know? [...] Something tangible is just really important"*. Notably, this sub-theme outlines giver thoughts, worries, and opinions about the subjective nature of gifting a memory recollection, as opposed to traditional physical gifting modalities where givers usually worry about how a gift item is received.

Practical implications of gifting a memory: Participants (3, 4B, 6, 7, 8, 9, 10) noted various practical considerations and limitations of using MeMa to create a gift. Participant 4B discussed the time implications, where it could take both effort and time to find images to form the gift. An alternative consideration was provided by Participants 6 and 8, who both discussed digital literacy of the gift-giver and recipient, Participant 8 adds: *"Now I wouldn't gift anything to previous generations [...] So for example, I'm not going to send a link to my mother. It is just too complicated [...]"*. Participant 6 mentioned how rendering physical images into digital or taking an image of another screen may impact the quality of the image: *"I'll have to go into Facebook onto where I send my digital pictures and I can't really upload them, I can take a picture of my computer screen, that's not going to be good quality"*.

A further area of debate was how to organise memories. Generally, participant viewpoints varied with some preferring drag and drop options, and others suggesting a more linear approach to chronologically organise their memories and potential gifts. Participant 10 elaborates, *"Maybe keeping them like different folders? Or files. [...] Yeah, I think it should be just the basic drag and drop thing"*. Participant 9 shared an alternative idea, stating it would be interesting to visualise memories and how this could transform into a gift, *"[...] visualise memories like this would be would be really interesting [..] way of being able to gift a lifetime of memories to somebody. To be able to to interrogate it in different way"*.

6 DISCUSSION

Findings have highlighted the varying experiences of gift-givers creating a gift using MeMa, resulting in three overall themes to capture participant experiences. In this section we reflect on two main areas. The first reflects on using personal memories to create digital gifts. The second takes a more practical look at the considerations for designing digital gifting technologies.

6.1 Reflections on framing personal memories as digital gifts

This section is split into two parts. The first part sets out the place of media and archives for creating gifts. The second, examines the relationships between memories, emotions, and technology and considers the impacts on interpersonal relationships.

Re-purposing media and archives to create a gift: Prior works within HCI have documented prominent issues with organising, selecting, and distributing parts of our ever-growing personal digital archives [63, 76, 80]. Based on our findings, one option to address this issue could be to frame parts of our archives as a gift. We noted how the task of creating a gift tended to encourage participants to be selective with their media, resulting in what they deemed a valuable gift. To further reflect on this, we revisit Odom et al's. [54] concept of digital materials lacking form, rendering them "formless".

Formlessness in digital possessions is often due to the vast and disorganised nature of documenting and storing various media types. We suggest that participants were able to overlay personal and cultural media to give "form" to a collection of media and transform this combination into a rich new possession. Consequently, this provides an alternative view on how gift-givers want to give tangible objects in order to promote a more positive experience at the

point of exchange [22]. However, we did perceive two of our participants mention either gifting the physical MeMa, or mentioning the importance of a physical objects when gifting, aligning with the work of [39, 41]. In summary, gifting could be a lens that we use to sift through large volumes of personal media and physical objects thus counteracting some of the difficulty we currently experience when reflecting and organising personal archives.

Relationship between memories, emotions, and technology: Technologies and media are already recognised tools to support interpersonal relationships and communication [30], despite many studies within HCI and beyond focusing on this area [65, 75, 81], there lacked understanding of how this communication may transform from sharing to gifting. Similar to [65, 75], common dyadic relationship types of grandchild-grandparent and parent-child were mentioned by participants. Our analysis uncovered gift-giver motivations for using technologies like MeMa or media to tell a story to a grandchild, pass on their legacy to their children, and to preserve memories for future generations.

Prior HCI works have focused on the idea and embodiment of digital legacy [26, 50, 70], as have psychology works [7, 61]. For example, Bassett [7] discussed what happens with our persistent digital possessions after we pass away. Based on our findings, we uncovered how participants viewed gifting via MeMa as means of giving their memories to future generations. We also found that MeMa was used as a way to gift the memories of late loved ones and in a sense keep their memory alive, resulting in a mixture of emotions from participants.

Throughout the process a range of emotions were experienced: regret, loss, sadness, joy, humour, happiness, and empathy, all of which align with nostalgic experiences [32, 82]. Previously, Whittaker et al. [80] note the importance of digital tools going beyond recall and we argue that MeMa provided a creative solution to enable gift-givers to complete the gifting task whilst supporting reminiscence and reflective cues.

To understand these memory cues further we expand and relate our findings to van den Hoven et al's. [74] work on memories and possessions. We suggest that digital gifts formed of memories align with connection type C2 "Memories expressed through possessions". Whilst we found concurring evidence that participants could use their digital and physical possessions to represent and cue memories, we uncovered through the lens of gifting how this connection type practically manifested. This began with participants mentally selecting a memory, then they searched for appropriate media to bring it to life, which in most cases resulted in wider memory cues when viewing digital possessions, aligning with the work of [73]. Thus, we propose that technologies like MeMa may indicate future ways and methods of gifting, all of which could be a more fitting gifting modality in our increasingly virtual societies.

6.2 Considering future digital gifting technology designs

This section takes a practical look at the considerations and implications for designing future gifting technologies, it is divided into two parts. The first, presents an overview of gifting digital memories and the relevant findings from the study of MeMa. The final part outlines four considerations based on this work and reflects on areas of capturing exchanges, technical possibilities, framing memories, and relationships.

An overview of gifting our digital memories: We summarise our key findings in Figure 9, which highlights three main areas: media, giver motivation, and giver experience. Firstly, we note that a mixture of public, cultural, and personal media can be used to create a digital gift. We highlight some popular media types such as music, notes, photos, and videos. Further, creating different dimensions or layers to gifts can contribute to a compelling narrative, for example playing music whilst displaying an image.

Secondly, giver motivation was a prominent area of this study, with findings showing how this can range from wanting to tell a story to grandchildren, to preserving a late loved ones memories, and to gift memories to promote conversations within families. All of this motivation relates back to the type of media chosen, which ultimately promotes

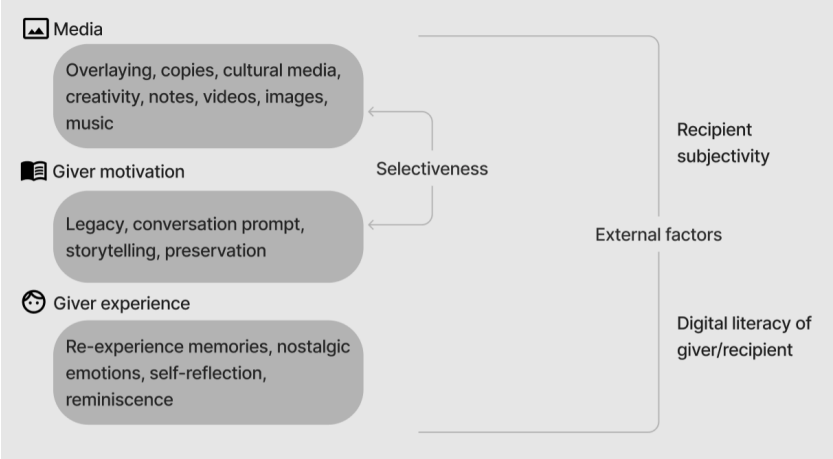

Fig. 9. An overview of transforming memories into gifts

selectivity and organisation regarding what media types to use. As seen in Figure 9, selectiveness relates to giver motivation due to the underlying reason for the gift. For example, if a participant's memory was of their father who had passed away, their motivation was a conversation prompt with their grandchildren, this then prompted deciding which media to use, resulting in a selective activity.

Thirdly, givers get to re-experience autobiographical memories when creating a gift for someone else. This can result in multiple reflections on the self, people, objects, and places which can evoke nostalgic emotions. Of course all of which we have discussed comes with limitations and drawbacks, many of which were raised by participants themselves. We define these "external factors" as aspects which can impact on the exchange. For example, the inherent subjectivity to classify an artefact as a "gift", where giver may class their memory as a gift but the recipient may interpret it differently. From a more practical angle, the digital literacy of both giver and recipient may impact on the exchange, which could make these types of digital gifts inaccessible to create or consume.

Future considerations for designing digital gifting technologies: We further reflect upon four future considerations for designing within this space. Firstly, participants generally viewed this gift creation positively with some (Participants 1 and 7) mentioning the study has made them realise they should be documenting and recording memories for others more frequently, yet there remains a challenge of how they can be gifted. Thus, we recognise a significant design challenges of how the actual 'sending' of a gift from technologies would take place. One participant (8) mentioned emailing a link directly from MeMa to their recipient. Whilst others (Participants 9 and 10) suggested gifting the physical device or pairing the memory with a tangible object, similar to hybrid gifting modalities [39, 41], perhaps uncovering how gifting memories could take multiple formats in the future. A related consideration is how memories are presented as a gift within an interface like MeMa, future designs could focus on a specific 'gift creation' function which is solely aimed at capturing media-memories for gifting purposes thus differing from an album page or collage.

The second consideration is how we capture a gift exchange in its entirety. This MeMa study was an inquiry of gift-givers interacting with a device which could facilitate the creation of a digital gift formed of various possessions, media, and memories. Thus, we did not set out to capture recipients' viewpoints. However, some participants (1 and 4B) did discuss their memories with others during the study with family members, providing us with some insight into how

these gifts may be received. Therefore, future work in this space could build upon these findings from gift-givers to design for recipient experiences.

The third consideration is the framing of memories. We asked participants to create a gift on MeMa and within the instruction manual we provided a prompt to think back to their childhood. We argue that having a prompt(s) or cues for participants encourages selectiveness and reflection. In future designs, researchers could explore the idea of a 'linchpin' as mentioned within our user testing phase, which is a trigger or basis for a media-memory. Yet, it should be noted that framing or guiding users through these experiences is not always positive. Researchers should be cognizant of negative emotions associated with recall and reflection.

The fourth and final consideration is how interpersonal relationships leverage technologies and media. The study of MeMa is an example of going beyond the routine everyday capturing and sending of media between families. Instead, MeMa is a 'slower' technology, it is not instantaneous. Creating a gift involving media requires introspection and time from a gift-giver, who in turn anticipates strengthening interpersonal bonds underpinned by clear motivations (conversations, legacy, storytelling, and preservation). Therefore, we recognise there are multiple relationship types that could benefit from gifting media not just for communicative purposes but for emotional bonding, especially when families are separated geographically. Researchers interested in this space could explore the impact on relationships via gifting digital personal memories.

To further apply the implications from this study, we encourage researchers to consider technical functions of devices facilitating exchanges between givers and recipients. These further can be used with the three key areas presented in Figure 9 of media, giver motivation, and giver experience, which could be lenses for designing future gifting modalities, or could extend beyond gifting and support those researchers in the technology-mediated reflection space.

7 LIMITATIONS

We note that our recruitment methods resulted in familiarity with some participants. For example, one participant was related to a researcher. However, we ensured that the researcher did not facilitate any of the focus groups or interviews in which their relative was present.

Further, we recognise that the family focus groups had to be split into interviews due to availability which perhaps impacted on results. We ensured to keep the format as similar as possible, but recognise the limitations of this. Within the older adults focus group we observed a range of empathy, joy, vicarious reflections, and humour which were shared amongst the seven participants, where the same format was not possible in the family group of one or two participants.

8 FUTURE WORK AND CONCLUSIONS

This work set out to explore if a technology probe (MeMa) could facilitate the creation of digital gifts from autobiographical memories, aiming to uncover the types of memories selected, the media used, and giver motivations.

We uncovered how the framing of a gift promoted selectiveness within gift-givers, enabling them to merge both personal and public media to create new cherished possessions. We note how motivations of storytelling, legacy, and preservation encouraged an introspective gift-giver process, resulting in nostalgic emotions and reminiscence. We recognise the place of media being a cue to facilitate reflection on lived experiences, all of which was supported via MeMa, which is one solution to using technology to support both emotional human experience and the gifting ritual.

We view the contribution of this work as, (1) new knowledge on technology supporting gifting practices including design implications. (2) In depth understanding of gift-giver emotional and practical experiences of framing their

memories as a gift. Lastly, (3) an illustration to demonstrate key components involved in transforming memories into gifts, which could be used for future works involving gifting, technology, and emotion.

Moreover, in the MeMa study we paid attention to engaging relevant stakeholders throughout the process. Also by taking an inclusive approach we captured relevant voices via taking particular care to ensure that people from marginalised demographics are encouraged to participate. In any future work involving the MeMa or similar technologies, continued awareness of responsible research and innovation practices are highly important for reflection and contribute towards meaningful engagement with stakeholders.

In the future, we anticipate and encourage work that focuses on new gifting modalities. Specifically, this work alludes to an opportunity to create prototypes and probes which delve into both gift-giver and recipient experiences of gifting memories. We also recognise a potential avenue for future work in addressing problematic memory recall, such as how technologies like MeMa could assist with memory decline, identity preservation, and dementia. Perhaps in future work, MeMa hardware could be developed further to create a dedicated device to take into settings like care homes. This could assist with evaluating the idea of a physical machine to store memory constructs that we wish to gift to others. A further area of exploration could be the idea of gifting memories on the behalf of communities for the purpose of cultural legacies in addition to gifting within familiar family or friend groups. We hope this work contributes to existing studies in the technology-mediated reflection space, but also demonstrate how we can re-purpose digital collections to form personal and valued gifts.

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