

# What Happens After Death? Using a Design Workbook to Understand User Expectations for Preparing their Data

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## ABSTRACT

Digital data has become a key part of everyday life: people manage increasingly large and disparate collections of photos, documents, media, etc. But what happens after death? How can users select and prepare what data to leave behind before their eventual death? To explore how to support users, we first ran an ideation workshop to generate design ideas; then, we created a design workbook with 12 speculative concepts that explore diverging approaches and perspectives. We elicited reactions to the concepts from 20 participants (18-81, varied occupations). We found that participants anticipated different types of motivation at different life stages, wished for tools to feel personal and intimate, and preferred individual control on their post-death self-representation. They also found comprehensive data replicas creepy and saw smart assistants as potential aides for suggesting meaningful data. Based on the results, we discuss key directions for designing more personalized and respectful death-preparation tools.

## CCS CONCEPTS

• Human-centered computing → Interaction design.

## KEYWORDS

Death; data management; design workbook; digital legacy; design

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## 1 INTRODUCTION

Preparing for death is not an undertaking that most people eagerly embrace. It can involve tedious planning and careful consideration of the things worth leaving behind, whether for further arrangements or to pass on to the bereaved. Many of the things that people believe are worth remembering from their own lives are becoming digital, such as photos, videos, messages, or diary entries. While alive, people often care for these items. They might keep them,

curate them, and reflect on their experiences with them [58, 63]. Yet, when it comes to preparing for death, these possessions are mostly ignored.

Very few people prepare their digital data in anticipation of death [38]. This lack of preparation can be seen as part of the general *benign neglect* [35] that often informs people's data management practices. But the consequences of not preparing can be unpleasant or painful for the bereaved: some people may lose access to a big part of their loved ones' lives, as many of the activities we do are now almost exclusively on digital devices [36]. As an example, consider the case of a woman who had to hack into her late mother's iPhone to save the memories stored within [6]. Although her mother had shared the passcode only a month prior to the car accident, it no longer worked. The daughter was locked out with no access. The device held more than the details required for planning a funeral and resolving financial accounts; it represented her mother's memories through digital photos, conversations, and notes.

When people do prepare their digital data for death, they are likely to face challenges. The vast quantity of data makes it difficult to select what is valuable for others and what to delete [5, 58]. Even knowing the extent of one's data can be hard since data is usually spread across many devices and cloud platforms [44]. For many, the motivation to prepare for death only comes when dying appears imminent [29]. But preparing a lifetime of digital data with limited time can be overwhelming. This can lead to strategies of avoidance or sharing passwords with the bereaved [47], transferring the responsibility of managing digital data to other people.

Previous work has highlighted the need for tools to support the preparation of digital data for death, pointing to opportunities for supporting users continuously before the end-of-life [24] and identifying who among the bereaved would find their digital data valuable [26, 38]. We focus on three reported user needs as our key research areas:

1. *Nudging*: How can we nudge users to begin the preparation process? Nudging is a term popularized from behavioural economics, and HCI-related work [37, 62] extends nudging into digital decision environments like websites and apps. Digital nudging examines if minor changes in these environments can influence users' behaviours.

2. *Control*: How can we provide flexible control over digital assets? What level of control is desirable? Users desire control over their life narratives, but can be easily overwhelmed by the volume of content and the effort involved [30].

3. *Collaboration*: Can a collaborative process between the user and their loved ones support choosing meaningful digital assets for the bereaved? If so, how should we approach the design of collaborative tools? Users are often unsure of who would find their

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digital data valuable [26]. Involving loved ones in the process may add insight and clarity.

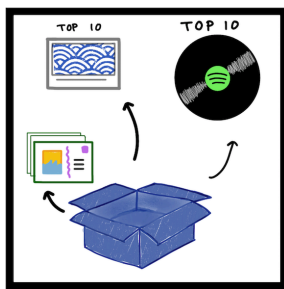
To answer these questions, we used a Research through Design (RtD) [67] methodology to explore how to support users in preparing digital data for death. First, we ran an ideation workshop to identify design opportunities and generate ideas to explore; then, we created a digital design workbook to capture possible approaches and perspectives. The design workbook includes 12 speculative concepts in the form of evocative illustrations, each with a descriptive paragraph. We presented it to participants as a slideshow presentation (available in supplementary materials).

Each design concept captures several approaches, based on related work, existing tools, and emerging user needs. An example is *The Box of Data* (Fig. 1). We used the design workbook [21] as a tool to elicit user reactions in a study with 20 participants ranging in age from 18 to 81, who had varied occupations and cultural backgrounds. Participants' reactions to the design concepts pointed to nuanced and complex expectations for how the process of preparing digital data in anticipation of death should take place. Participants wanted the process to feel intimate and personal and expected to experience different types of motivation at different life stages. They also preferred individual control, rather than collaborative input, on their post-death self-representation. Finally, they saw smart assistants in existing tools as helpful for recommending meaningful data to prepare and leave behind. Based on participants' reactions, we outline a set of design opportunities for moving the design space forward, focusing on maintaining agency, daily practices, and transforming existing tools.

The main contributions of our work are: 1) A set of possible approaches for preparing data for death represented through 12 design concepts; 2) An empirical account of user attitudes and expectations for preparing data for death; 3) A set of broader design directions that can help designers create innovative tools focusing on personalization and respecting intimate practices.

## 2 BACKGROUND AND RELATED WORK

Multiple strands of research have examined common user practices for managing digital data while alive, highlighting the complicated nature of modern data ecosystems [56]. In general, many technology users struggle in having control over their data [35, 58, 63], especially on cloud platforms [44]. High volume of data, different



### The Box of Data

Make your digital data come to life after you die with the Box of Data! We will assemble the best of your data and turn it physical. This is what will come in the box: a vinyl with the top-10 songs you listened to in your life, 10 postcards from the most visited locations in your Google Maps history, your top-10 most-liked Instagram photos, and your top-10 popular tweets or posts from your Facebook timeline. Custom packages are also available. We will send the box to your selected recipients after you die.

**Figure 1: The Box of Data, one of 12 speculative concepts, as it appeared in the design workbook.**

levels of motivation, and the effort and time required often influence user practices [5, 30, 58]. Some might decide to keep most of their data, while others might try to discard as much as possible [30, 58]. Yet, even though managing digital data can be a source of challenges and frustrations, people still find value in their collections of digital items. Personal archives can be a source of pride, enjoyment, and fulfillment [16, 32, 58, 61], with users valuing different types of digital items [22, 23, 43]. It is common for digital data to act as an extension of the self [4, 16], a key pillar of self-expression and identity that informs how people think of themselves and what they remember of their life, just as with physical objects and mementoes [4, 15, 53]. But as the amount of digital data that people manage in their daily lives continues to grow [19], HCI researchers have called for an increased focus on how data management practices relate to death [31, 50, 60]. This is the domain that our work investigates.

**HCI research on death:** Past HCI work on death has examined the intersection of technology and death in areas such as bereavement practices, online support systems, and crafting digital legacies. Bereaved individuals inherit physical devices like TVs and computers with relative ease, but are often unaware of the afterlives of email accounts and online banking [38] (perhaps due to lack of access). Opportunities for design to support bereaved practices focus on navigating the sensitive emotional and social landscape after the death of a loved one and understanding how design can support the grieving process [39, 42, 49, 51]. Most online systems that support death-related practices, like DeadSocial and It's Ok to Die, have small user bases [24]. However, some people have already been using popular social media platforms as sites of grief and mourning [12, 13]. For example, some users publicly grieve by posting on the deceased's Facebook profile, seeing it as "no different from putting flowers on a grave." [13] A key unmet user need is how to help users in preparing their data as part of a digital legacy before they die. This is the specific process our work focuses on.

**Preparing and bequeathing data to create a digital legacy:** We refer to *preparing digital data for death* as the process of choosing what data to delete, transform, or bequeath after one's death. The data people choose to prepare eventually becomes their *digital legacy*. The term digital legacy refers to any data meant for passing down to friends and family [25]. Our digital legacies can include the online identities we create, abandon, or discard over a lifetime [25]. Research about the value of digital data as inheritance suggests that digital legacies are worth creating [25]. Yet, users may face difficulty with assessing the value of their data, negotiating exposure of their online identities, and managing the quantity and diversity of their data [26]. Tools designed for families can help resurface personal and familial digital data to encourage meaning making and hands-on curation [27]. Past work on practices for sharing and archiving possessions in the home [23, 33] points to collaboration as potential solutions to user needs about assessing value and managing digital legacies. In our study, we explore ways for supporting collaboration, resurfacing data, and helping users assess the value of their data as practices that can help prepare a digital legacy. We also look at how everyday tools should support these practices: we explore a range of design approaches and possibilities that can substantially evolve existing tools and better support user expectations.

**Existing tools and practices for bequeathing data:** Only two large technology companies offer services for managing data

on their platforms posthumously: Facebook’s Legacy Contact [11], introduced in 2015, allows users to choose a trusted contact to manage their account after death; Google’s Inactive Account Manager [54], introduced in 2013, allows users to delete their data after a period of inactivity or designate 10 contacts to download their data from various Google products. However, most users do not use these tools: a 2019 survey of 478 internet users (ages 18-70) found that only 6% of respondents had used these tools [40]. Instead, access by proximity, i.e., sharing passwords with a spouse, is a common way of providing loved ones with access to data both while alive and after death. Password-sharing stems from social trust and shared account use, rather than relying on digital tools [47]. Yet, many users feel uncomfortable with the idea of passing on their passwords, especially to their children, as it gives unrestricted access to all their data [26]. These contradictory user practices and beliefs suggest that password-sharing might stem from low awareness of more effective tools, and that existing tools might not adequately support the preparation of data for death.

In our work, we explore a range of design approaches for creating new tools that can better support user needs and match their expectations for preparing data in anticipation of death. Several of the design concepts we explore draw inspiration from past design work on digital data. For example, the idea of embedding and transforming digital data into physical possessions takes inspiration from past work on technology heirlooms and the potential of combining material objects with digital media [2, 20, 41, 45]. We also integrate ideas from past work on photos as mementos [46, 55] and multigenerational family archives [27]. Altogether, we explore varied design approaches through the 12 design concepts and show how to integrate these design opportunities into the process of preparing data before death.

### 3 METHODOLOGY

To answer our research questions around nudging users, providing flexible control, and supporting collaborative processes, we used a Research through Design (RtD) methodology and created a design workbook that captures key approaches and perspectives. Our work draws inspirations from a set of related RtD methods: i) *Design Workbooks* [7, 21, 64], collections of closely related design proposals used to conceptualize, reflect on, and refine a design space; ii) *Speculative Sketches* [18], illustrations that solidify ideas into concrete but not fully complete representations; and iii) *Speed Dating* [17, 66], a method to explore a variety of ideas with target users without full technical implementation.

We took a three-phase approach: 1) First, we ran an ideation workshop to seek design opportunities and generate a large number of design ideas to explore; 2) Then, we created a design workbook with diverging approaches and perspectives; and 3) Finally, we ran an interview study with 20 participants to elicit reactions to the design workbook and better understand user expectations.

#### 3.1 Ideation workshop




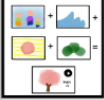




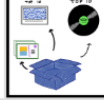


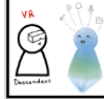
To begin our exploration, we organized a two-hour online ideation workshop to generate design ideas. In addition to the three authors, we invited three graduate students and one post-doctoral fellow,

all with experience in HCI, from the same university to participate. This was originally planned to be an in-person workshop with a diverse set of participants, however, COVID-19 limitations required a transition to an online format, pushing us to use a convenient sample of HCI researchers and designers as opposed to a more diverse sample. In the workshop, we followed Google’s Design Sprint framework [1]. After we contextualized a possible design space by explaining the research questions (from the Introduction), key user needs, and related work, we asked participants to identify potential areas to explore (e.g. “How might we make the process of receiving digital inheritance a meaningful, human, and sentimental experience?”). These areas became the starting points for brainstorming low-fidelity design sketches that could help us understand future directions for technology. Each participant quickly drew and presented four sketches. We gathered all of the sketches and each participant voted on three sketches in terms of how useful, interesting, and feasible they were for addressing key research questions and user needs. (Workshop participants were aware of our planned methodological approach for the follow-up elicitation study and, having a background in HCI, were able to assess the potential usefulness of different sketches for the study). After voting, we looked at the sketches with the most votes and the voters were asked for their rationale followed by general discussion. After the workshop, two team members reviewed all 28 sketches (some overlapping). We redrew sketches and listed the design approaches of each sketch to ensure that as a set, the sketches would address the research questions. We began with 23 design concepts. Many were based on the sketches from the ideation workshop, but several more were introduced to cover more approaches. We wrote a short description for each design concept to flesh out its interaction features. However, 23 design concepts proved to be too many for the planned interview. To see what could be merged or discarded, two team members discussed which concepts were too similar and merged four concepts into two and removed seven other concepts. For example, we removed Privacy Recommender and Privacy Deleter which were too similar to *Privacy Keeper*, a privacy-focused recommender system, which was included as one of the final concepts.

#### 3.2 Design workbook

The final design workbook contains 12 design concepts, each presented as a sketch and a short description. Based on the three key research questions outlined in the Introduction and Related Work, we conceptualized a set of design approaches to explore with the workbook. Table 1 provides an overview of each design concept with a small icon, name, and list of design approaches (noted in italics in the sentences that follow). We explored the question of preferred level of control in data selection (RQ2), with *user-selected*, *computer-selected*, and *AI-powered* alternatives that are inspired by both existing tools (coarse user control in Google’s Inactive Account Manager, small degree of control in Facebook’s Legacy Contact) and related work on automation in support of data curation [27, 59]. *Nudging* (RQ1) and *collaboration* (RQ3) were also key approaches we explored, with *gamification* being a combination of both. Approaches that focus on *crafting* (creating something new with data), *tangible objects*, and *memorial*, instead, are based on viewing data

**Table 1: Overview of the 12 design concepts included in the design workbook. The italicized text is the name of the design concept. The labels below the name describe the design approaches explored in the concept. The 6 concepts marked with yellow circles are enlarged in separate figures in the paper; all 12 appear in supplementary materials.**

	<i>The Other Side:</i> user selected		<i>Preparedness Badge:</i> collaborative, nudging		<i>Generation Cloud:</i> collaborative, user selected, memorial
	<i>Made for You:</i> user selected, computer selected, crafting, nudging		<i>Future Stories:</i> user selected, crafting, memorial, nudging		<i>Memory Swipe:</i> collaborative, user selected, gamification
	<i>Checklist Crusher:</i> user selected, computer selected, nudging, collaboration, gamification		<i>The Policy Explainer:</i> tangible object, nudging, privacy-focused		<i>The Box of Data:</i> tangible object, crafting, computer selected
	<i>Share Forever:</i> user selected, saving on the go		<i>Privacy Keeper:</i> user selected, computer selected, privacy-focused, AI-powered		<i>Blast from the Past:</i> AI-powered, memorial

as part of a legacy to pass down: this idea stems from related work on cherished possessions [22, 41] and digital legacy [26]. We also explored *saving on the go* as part of continuous, rather than end-of-life, support based on past research on death-related support systems [24]. Finally, we considered a *privacy-focused* approach, inspired by related work on deletion as part of a data management strategy [57].

Ideally, the design workbook would be a physical booklet, with space for participants to imagine, scribble, and co-speculate using the design concepts as a guide. Due to the COVID-19 pandemic, we simplified the process; instead, we created a slideshow presentation with the 12 design concepts and their descriptions (a PDF version of the workbook with all 12 concepts is included in the supplementary materials to the paper; additional examples appear in Results).

## 4 ELICITATION STUDY

To elicit reactions to the concepts, we conducted semi-structured interviews with a varied sample of 20 participants.

### 4.1 Participants

After piloting the study with two graduate students, we posted a screening survey (available in supplementary materials) on a university recruiting list and Craigslist in a major North American city. We received 222 survey responses and conducted the interview with 20 participants (14 women, 6 men) primarily selected based on their age, occupation, and parental status. The screening survey also asked about household status, expertise with technology, experience with programming or computer science, and familiarity with Google's Inactive Account Manager and Facebook's Legacy Contact. We wanted to capture broad and varied perspectives from all age groups. Older adults were an important demographic to include as they were more likely to have experienced a death in the family and prepared for their own deaths. However, older adults were more difficult to access online.

The participants' ages ranged from 18 - 81 (median age: 46.5) with 8 younger adults (18-35), 8 middle-aged (36-64), and 4 older adults (65 years old+). 10 participants were parents. Occupations

included engineer, student, consultant, biochemist, program coordinator, businessman, lawyer, sales representative, director of product management, physiotherapist, systems analyst, and retired (professor, teacher, college instructor, lawyer). Supplementary materials include a table of participants' age and occupation. Most participants resided in North America, but one participant lived in Ireland. Although we were not recruiting for diverse cultural backgrounds, the participants' self-reported cultural backgrounds included Canadian, American, British, Turkish, Punjabi, Russian, Japanese, Chinese, and Taiwanese. Participants self-reported their technical skills, with 8 selecting above average, 11 average, and 1 below average. Most had no experience in computer science or programming.

### 4.2 Procedure and Data Collection

Each interview session, lasting 67-100 minutes (average: 82), consisted of three parts: a short introductory interview, an exploration of the design concepts, and a debriefing interview. One member of the research team conducted all interviews online using Zoom and took notes. We also audio and video recorded the interviews. Participants received \$20 in compensation. We began with a short introductory interview about participants' thoughts about preparing data for death. We also asked about their familiarity with and use of Google's and Facebook's death-preparation tools. Then, we began the design exploration. We asked participants to open the design workbook on their browser and share their screen. We emphasized to the participants that the designs were not prototypes as we wished to understand reactions towards the design approaches, rather than assess the concepts' marketability or feasibility. Participants read the description of each design concept aloud and described initial reactions upon seeing the design concept. We asked follow-up questions for each design concept to further explore specific aspects of or design approach, for example, "How do you feel about having your profile and other people's profiles show something related to death and data?" After seeing all the design

concepts, we ended with a debriefing interview about their general impressions and any particularly interesting reactions towards certain design concepts.

### 4.3 Data analysis

We used reflexive thematic analysis for our data analysis [9]. Two members of the team did most of the coding and further analysis of the transcripts. The analysis process was both deductive (grouping codes into categories based on specific concepts or design approaches) and inductive (grouping codes into categories based on similarities). As an example, we created a deductive category based on the design concept *Blast from the Past*, an AI replica of an ancestor. The deductive category "AI replica" had codes like AI replica is creepy, an AI replica is controversial, wanting to remove negative data from AI replica. The inductive category "Data as representation" instead contained codes describing how participants viewed their data (e.g., data should be positive, data is limited for older adults, top data does not represent me). Then, from thinking about the connection between "AI replica" and "Data as representation", we constructed the theme "Data cannot fully represent an individual", centered on data representing an individual and its limitations. Throughout the process, we worked towards creating "storybook" themes, each with a core central idea that together told a story about the data. We reviewed, merged, and discarded early themes to construct a final cohesive analysis of participants' reactions. All members of the team discussed and iterated on the themes and subthemes over several months. We returned to the transcripts and codes to confirm that the final themes and subthemes were cohesive with participants' reported experiences, including stories and their specific language used.

### 4.4 Positionality stance and reflexivity

We reflect on the process and the choices we made to better contextualize our analysis process. Reflexivity is a practice that Braun and Clarke advocate for to achieve research transparency [10]. This approach has similarities to Constructivist Grounded Theory [14]. We focus our reflection on our motivations and individual positioning which influences our research design and data analysis.

During an earlier study around long-term data management, we became interested in managing data for a truly long-term prospect: how do people choose and discard digital data for death? One author (mid 20s) views knowing how to prepare for death in a data-driven landscape to be increasingly critical for future generations. Another author (late 20s) sees taking care of personal digital data or at least the tools and knowledge to do so as an important skill in our society. Neither of these authors have children nor have prepared for death, digitally or otherwise. The third author (middle-aged) has a will, which is periodically updated, and believes that providing her family, including children, access after death to their shared digital items is important, but has done little other than share where relevant passwords can be found. With the exception of one author who comes from a mixed Eastern-Western cultural background, the two authors have a Western cultural background. We acknowledge that our positioning as researchers at a Western academic institution influences our cultural attitudes and beliefs towards designing research about death and technology. For example, the Western

influence of secularism may have reduced our inclusion of religion and spirituality in the design concepts.

## 5 OVERVIEW OF PARTICIPANTS' REACTIONS

In this section, we provide an overview of the reactions to the design workbook and highlight specific design concepts that received particular attention. For context, prior to the interview, few participants had prepared their data in anticipation of death. After discussing the design concepts, most participants believed that death preparation of data was an important consideration.

The reactions to the 12 design concepts were diverse and nuanced. Table 2 provides a high-level overview of participants' reactions, categorized into positive, negative, neutral, and mixed (i.e., positive reaction towards some aspects of concept, negative reactions towards other aspects). Only one participant did not react positively to any concepts (P20); each concept had at least one participant who reacted positively to it. The variation in reactions reflects individual differences such as age and experience with loss. We do not intend for the table to provide direction on which design concepts should be developed, rather, we present an overview of reactions to ground the themes from the analysis.

The COVID-19 pandemic [52] influenced some of the participants' reactions. A few participants mentioned the pandemic as reasons to prepare for death and recalled seeing pandemic-related deaths on their social media feeds. Among older adults, three out of four reacted largely negatively to the concepts (P16, P19, P20), and one had somewhat more mixed reactions (P12). The older adults in our sample found some of the concepts to be inapplicable or irrelevant because of factors such as lower use of social media and smaller quantity of data online.

The most positively received design concept was *Generation Cloud*, a collective repository for generations within a family to upload cherished data such as voice recordings, location data of travels, historic photos, and favourite songs. Participants were interested in tracing a digital family history and were inspired by dynamic and multigenerational cherished data. Two design concepts garnered negative reactions from almost all participants: *Memory Swipe*, a real-time collaborative game where loved ones vote on data they deem valuable enough to inherit, and *Blast from the Past*, an AI replica of an ancestor. While we expected that *Blast from the Past* might come off as "creepy" to some participants, we were surprised to find that the most disliked design concept was *Memory Swipe*. Participants were averse towards giving loved ones control to choose data on their behalf: they worried about differences over the perceived value of their digital data.

**Familiarity with tools from Google and Facebook:** Some of the participants had seen memorialized accounts on Facebook before, but only one had listed a legacy contact. Nobody in our sample had used the Google Inactive Account Manager, although some had heard of it. No participant had searched for after-death data storage policies from Google or Facebook before participating in our study. Many speculated on the fate of their digital data after death: many wanted it deleted, others felt that it was inevitable that their data would continue to be sold and mined for new products.



Table 2: Overview of participants' reactions

	P3	P8	P7	P10	P9	P6	P1	P15	P4	P11	P14	P5	P18	P17	P13	P2	P19	P20	P16	P12
Age (ordered)	18	24	26	26	27	31	32	34	41	43	50	52	54	57	60	64	65	74	75	81
The Other Side																				
Made For You																				
Checklist Crusher																				
Share Forever																				
Preparedness Badge																				
Future Stores																				
The Policy Explainer																				
Privacy Keeper																				
Generation Cloud																				
Memory Swipe																				
The Box of Data																				
Blast from the Past																				

Positive Neutral Mixed Negative

## 6 THEMATIC ANALYSIS RESULTS

In this section, we present the results of our reflexive thematic analysis. First, we present a high-level summary and then delve into individual themes. Participants at different life stages had varying levels of motivation to prepare for death. When it came to the process of preparation, they wanted the process, and the tools, to feel intimate and personal. Participants prefer tools that support and maintain agency over data and some were receptive to familiar elements like physical media and smart assistants. Data cannot fully represent an individual and trying to do so may be ill-received.

### 6.1 Preparing data for death requires different types of motivation at different life stages

Experiencing a death in a family is a common motivation to start thinking about one's own death. Additionally, certain motivators can prompt consideration of preparing for death. Participants' individual differences such as age and parental status combined with the current life stage explained some of these sources of motivations.

**Motivated by experience with loss:** Participants who had experienced loss were more conscious of the possible burden created post-death for the bereaved. These participants felt that experiencing loss could be a motivation to make death preparations. For example, P16, a retired 75 year old professor, was motivated by the death of her mother, making her want to ease the burden of physical possessions for her children: "I have so many papers and I'm trying to get rid of some because I don't want this task to be daunting for my kids. I cleared my mother's house and it's a struggle. The time is limited, you're feeling very sad and you don't have the judgement." In line with this, P16 had created a digital file called "where my stuff is" for her son to access after her death.

Past experiences with physical possessions often translated to the digital. Like physical possessions, data can be difficult to track

down and overwhelming in quantity, but unlike its physical counterpart, digital data is often inaccessible without password sharing or predetermined actions to transfer data. Like with physical items, data can be burdensome as inheritance [26]. P5 said that leaving unorganized data for her children to handle would feel "selfish... this would just be another added stress."

**Motivated by perceived shorter distance to death:** Research suggests that people who perceive themselves closer to death because of advanced age or severe illness are more likely to prepare for death [29]. P5, who was 52 years old with three adult children, felt an obligation to prepare her assets because of her health: "I've been off work sick on disability for two years and I'm undiagnosed and it may be a heart condition. So in reality, I should be thinking about stuff like that, just in case." She recently went to a lawyer with her husband to prepare their wills, but had not prepared digitally. The other motivating factors for participants to write a will were marrying, having children, and retiring; the traditional marks of passage for a new stage of life.



### Future Stories

Surprise your friends from beyond the grave! Post your data into the future: upload photos, messages, or songs, then pick a date at least 50 years into the future. The contacts you choose will be able to see your story on that date.

Figure 2: Future Stories

Participants who perceived death to be a distant, slim possibility were unprepared for bequeathing assets: “I’m not saving the data that I want others to see because at my age, I don’t plan to die soon,” said P4 (41 years old). We explored the idea of using gamification and incentives to motivate and support continuous death preparations in *Checklist Crusher*, an interactive tracklist that awards points and trophies for each data type prepared. P3 who was an 18 year old student said, “I really like the trophy idea and the points idea because it keeps people motivated to do some tasks that might be tedious.” Some older participants in our sample like P20 (74 years old) believed that incentives like receiving a badge were too “childish” for an “old curmudgeon like [him].” Another older adult (P16, 75 years old) opposed gamification and incentives: “I hate all this stuff about winning trophies and unlocking free space [...] I hate badges and all that stuff.”

**Motivated by seeing data as a gift:** Viewing digital data as gifts, rather than a burden, for the bereaved could be another source of motivation. Instead of a tedious chore, managing data could be framed as thoughtful meaning-making. We explored this idea with *Future Stories* (Fig. 2), a design concept about creating posts using photos, videos, and captions for the bereaved to receive in the future.

Some participants imagined feeling special to receive a personal message from a deceased loved one. P18, who was 54 years old lost her mother last autumn, reacted with pleasure to *Future Stories*. She felt that receiving a personal message from her would be meaningful: “If I were to receive [a message from] my mother five years from now that she had written last fall, that would be kinda cool. I think it’d be awesome. Because you’ve lost that connection entirely and you know that you can never see or talk to that person again and that’s what’s really hard about death so to receive something personal like that, that you know was actually done by them, it would be meaningful.”

Participants wanted the things that they deemed important to be sent to the future. P15 imagined sending data to her best friend’s daughter: “I can imagine photos, songs [her daughter sings], memories from when [her daughter was a kid].” A different example comes from P13, who greatly cherished her dogs and wanted to send photos of her dogs into the future. Participants discussed feeling wary of how (romantic) relationships could evolve over time: “it would be sweet if you were together but it’d be bittersweet if you weren’t or that person passed away.” (P15)

## 6.2 The process of preparing for death should feel personal and intimate

Participants expected the tools to create an intimate process by carefully involving loved ones. The process also feels personal to participants who viewed their data as capable of fostering connections across generations in their family.

**Cherishing data across generations:** To explore collaboration as a design approach, we designed *Generation Cloud*, a collective repository for generations of a family to upload cherished data (Fig 3).

We left the degree of collaboration open to participants to interpret as they wished. Participants felt great personal connection to their collective family history: “That’s a great concept. I’m really

into family tree aspects and knowing your family and previous generations, that is very interesting to me.” (P5) The preparing and passing of digital data becomes beneficial across generations, creating collective value. Seeing cherished data uploaded by ancestors could also inspire action. For P14, a 50 year old father of two teenagers, he initially thought that leaving behind passwords was better than preparing data. Upon seeing *Generation Cloud*, his perspective shifted: “That would be fascinating, actually [...] It contradicts what I was saying before. If I’m getting something out of it before, I can see more of the value of passing that onto my kids.”

When we asked participants about what types of data they cherished from their family, we received varied responses: many agreed with historic photos and favourite songs, but P8 suggested that the act of curation with family in mind itself imparts meaning: “Anything could be a cherished asset because it just serves as a good memory of your family and how you identify yourself because family are close and tight-knit. So, anything that they think are cherished assets, I would say I would agree.”

The asynchronous nature of *Generation Cloud* could span physical distances and decades of generations, yet participants’ reactions suggested that using a family repository could increase intimacy: “It will expand your circle, it makes you closer to your family.” (P10) For diasporic families, family repositories can transcend physical boundaries and store family legacies for future generations: “I immigrated to where I live right now so I never lived close to my family [back home]. Being able to access what’s back home in the cloud would be super awesome.” (P9) Unlike other forms of curation, a family repository could be a dynamic, evolving, and ongoing collaboration between users that are already intimately linked through a common bond. Uploading data could become a process that is personal and intimate because users could feel a relationship to other repository members and their data through contributing their own data.

**Failing to capture intimacy:** We explored what some considered to be the opposite of intimate: social media. In some ways, social media is a highly collaborative platform that absorbs and reflects social norms. We hoped that *Preparedness Badge* (Fig 4), a badge of preparedness on social media profiles, could harness social media’s power to encourage trends and motivate others to prepare data for death.

However, participants viewed social media as too public of a platform to share personal plans about death: “Honestly, I don’t

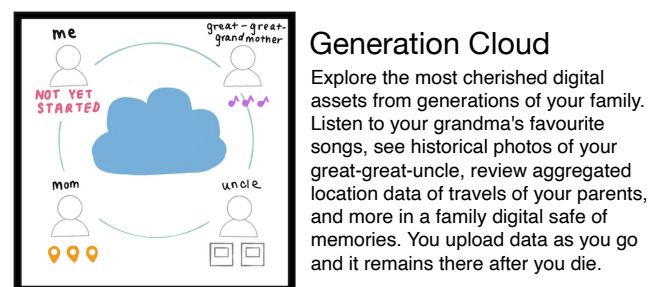
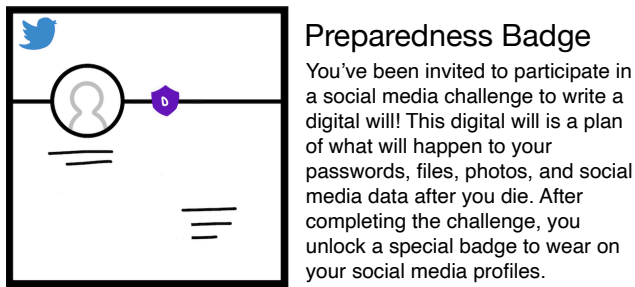


Figure 3: Generation Cloud



**Figure 4: Preparedness Badge**

want any people to know that I'm prepared. That's my business, not theirs" (P14). Younger participants were concerned about others' reactions: "People might worry about you or send a message like are you okay, you have digital will on your thing that you completed, like are you okay?" (P3) Their networks could worry about their health and safety as broader social circles appear to lack intimacy and sharing about death preparations can seem culturally taboo.

*Preparedness Badge* did not capture intimacy. We expected that some design concepts would provoke negative reactions which could guide design implications towards what participants were looking for. We saw that death is often regarded as a special and personal process and participants wanted death preparation to reflect this expectation: "This is impersonal for something that should be intimate and this is trivializing it." (P16). P16, in particular, found many of the design concepts to be "impersonal, remote, after the fact and not what I would find useful to do." Instead, having prepared for death herself, she saw the process of preparing as "personal, familiar, intimate."

### 6.3 Familiarity with existing tools and physical qualities can naturally extend towards data preparation for death

Participants who were familiar and comfortable with intelligent media libraries (e.g., Google Photos) and smart assistants were more receptive to using them for preparing their data. We also explored transforming data into tangible objects as a way to facilitate familiar material interactions.

**Familiarity with smart systems:** We explored repurposing existing tools in the context of death preparation as a viable approach to help users. In *Made For You*, automatically generated videos from photo libraries on platforms such as Facebook or Google Photos appear as suggestions as data to save and share after death.

Participants who were comfortable with smart assistants and auto-generated videos saw them as useful for saving and sharing data in anticipation of death. P3, an 18 year old student, viewed *Made For You* as a time-saving measure: "This is really cool because if the smart assistant does it for you, then it saves you the time of doing it." Another participant, P12, an 81 year old retired lawyer, enjoyed seeing unprompted videos in the past: "It popped up and I said, 'Wow, that's kind of neat. And then you think about it, and then you share it with some of the people that you were with when that picture was taken.'" However, not all reactions were

so positive. A different older adult in our sample, P19 (65 years old), a retired college instructor, felt "invaded" by auto-generated videos: "Creepazoid. I don't like the idea of digital or algorithms choosing." Several participants voiced a preference for manually creating videos, but recognized that they lacked the time or skill for putting these videos together.

Some participants' experiences with smart assistants prevented them from fully trusting AI's capability to understand their legacy-related needs. P7, for example, used a Google Home, a speaker with a virtual assistant, and said "Smart assistants can put something ugly or stupid. I don't trust [them] 100%." To prevent smart assistants from inserting embarrassing or private content, participants preferred to restrict access to private data and be able to edit, review, and delete suggested content: "For sure [I can imagine content that's embarrassing] which is why it's critical to have the option to decide what to include." (P15) Smart assistants could also nudge participants through reminders. However, participants thought that frequent reminders could be not only annoying, but also depressing as it could force participants to regularly contemplate death: "If there was such an app that was always reminding me [that I might die] [...] it would really push me to depression." (P11)

**Familiarity with tangible objects:** We explored the design approach of adding value by transforming data into physical representations in *The Box of Data*. This design concept automatically extracted top data and transformed them, such as taking a person's top 10 visited locations on Google Maps and turning them into postcards. Research shows physical, tangible objects are more valued than their digital counterparts [38].

For remembering the dead, it appears that tangible objects would be more cherished as well: "It just seems more real, it's tangible, you can touch it, you can hold it, you can hold the picture, you can go in a little room somewhere that's quiet without a computer [...] it's like a little gift." (P13, 60 years old) In contrast, digital data is weaker in presence and less valuable due to their quantity: "Physical stuff feels more important sometimes. It's the stuff you hold onto." (P3, 18 years old) Creating tangible representations of data for some participants could be viable alternatives for remembering. However, some participants noted that the physical can become obsolete as well. P13 gave an example of a tangible object that would not work: "Not a vinyl because [my niece] probably doesn't know what a vinyl is."

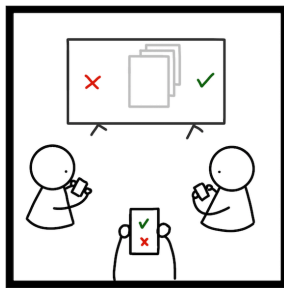
Another concept we used to explore physicality was *Policy Explainer*, a pamphlet to inform the public about steps to take to secure and prepare data for death. Many participants felt that physical pamphlets were ineffective: P17 said that it was essentially "junk mail" and would throw it away.

### 6.4 Maintaining control over digital data means having agency over self-representation after death

Data has meaning as an extension of self. We see this belief in participants' reactions to several design concepts, including *Memory Swipe*, *Privacy Keeper*, and *Made For You*.

**Agency as choice over data:** We explored how gamification and synchronous, in-person collaboration could be used to find





### Memory Swipe

Choose which memories are worth keeping after your death by playing Memory Swipe! Your selected photos, recipes, games, and certificates will show on the screen as the audience votes on which ones to keep.

Figure 5: Memory Swipe

meaningful digital data by designing *Memory Swipe* (Fig. 5), a collaborative game where loved ones can vote on what data to leave behind. Yet, most participants disliked *Memory Swipe* and refused to have their loved ones voting on their data: “I would rather give them the complete data and not have them vote on what they want to keep, because I want to be the decision-maker of what I give.” (P4) Keeping control over digital data can give authority to one’s own narrative and maintain agency to one’s self-representation even after death. A few participants did acknowledge that there is use to playing *Memory Swipe*: “You’d know how people are going to remember you and how. And you’re outsourcing the work.” (P15) However, P15 also felt uncomfortable reconciling the dichotomy between what she considered to be important and what the bereaved wanted to keep: “What I want might not be what they want. For me, it could be a publication or something, but they could be like, yeah, she was really good at making chicken nachos.” When comparing *Memory Swipe* and *Generation Cloud*, an interesting contradiction emerges. Participants saw a collective benefit in the process of preparing digital data in a shared repository and thought that it would be valuable (as in *Generation Cloud*). But they wanted the process to be individual, rather than collective (as in *Memory Swipe*). This suggests a tension that future design work should try to balance.

#### Control requires knowing about the extent of one’s data:

Not knowing the extent of one’s data hinders the process of hiding data deemed incongruent with self-representation. We explored the design approach of hiding data as a means to curation with *Privacy Keeper*. P5 was particularly overwhelmed by the large quantity of digital data spread across several of her devices; she found this concept useful because she was unaware of the data that she might want hidden: “I like this idea because I probably don’t even know what I have on my phone, iPad, of what should be private. I don’t believe I have stuff that should be hidden or deleted. But maybe I did search something at some time and I don’t want people to see that.” Furthermore, self-image can be protected by hiding frivolous photos, like “drinking, partying, and nature” (P15) and private information like “appointments with doctors” (P5), but only if users are aware that this data exists.

### 6.5 Data cannot fully represent an individual

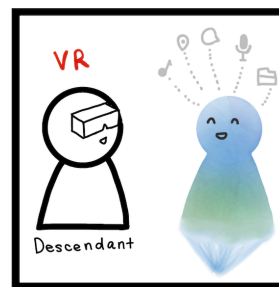
Many participants thought that preparing data for a digital legacy was valuable. However, some ways of trying to remember the dead

were not acceptable. Here, we discuss self-representation and remembrance.

**Data replicas are creepy:** “Oh, no, nightmare! [...] I think you’d get a little monster” (P16) is one of many similar reactions from participants upon seeing *Blast from the Past* (Fig. 6), a virtual reality AI replica based on the aggregation of the entirety of a user’s data. Many participants imagined an AI replica of themselves to be “creepy” and “scary.” These reactions suggest that “bringing a deceased person back” through technology is not an acceptable way of remembering them. P17, for example, found the AI replica to be insulting to the complexities of an individual: “That’s not the way I wanna remember someone... You’ve taken a complex human being and made them a little digital icon.” P18, a 54 year old whose parents had passed away expressed resentment at the idea of seeing an imperfect digital replica of a loved one: “If I were to see an AI replica of any of my loved ones that are gone right now, it’d just make me sad and a bit angry because it would be nothing like them. You can’t electronically recreate a human or human essence. I can’t see it making anyone feel good to see that.”

Switching perspective to the bereaved’s point of view, P2, thought it would be a scary experience for them too: “Oh my, I think it would just be something that would be rather scary. I don’t know if my descendants would want to even digitally [interact with me] in this kind of way.” Furthermore, P17 anticipated the AI replica preventing closure [8]: “If one of my kids passed away, I could see myself being obsessive. I don’t think that’s healthy.”

**Representing different, contextual sides:** AI replicas cannot represent all the different, contextual sides of an individual (with work from psychology providing a theoretical lens to the idea of different “selves” [3]). Participants doubted that a replica would be able to represent a person: “Even if they have all the information on me or what I’ve done or what I’m like or what my voice sounds like, it won’t be me or won’t be that person.” (P3) P9 felt that “for the most part, it’d be accurate”, but would be lacking in full representation: “The emotional side in a way, my personality traits, who I am as a person, those aren’t things I type up on the internet. Those aren’t things that can be represented by photos and search history. That would be missing.” P18 was worried that the AI replica might choose to bias non-representative sides: “If it’s looking through data that I have on my computer, poetry, spiritual Buddhism. It’s going to be spewing out things that my family will go ‘what the...’? It’d be nothing like me.”



### Blast from the Past

For the cost of giving away your lifetime data, this service will create an AI-powered replica of you based on all your data. Your descendants can use VR glasses to talk to your data-based replica. The AI-generated replica is based on information extracted from all your files, location history, photos, voice recordings, search history, and more.

Figure 6: Blast from the Past

The older participants in our sample, in particular, would be unable to be fully represented by their data. Unlike the younger and some middle-aged participants, older participants only had a subset of their life captured in digital data. P2, a 64 year old participant said: "I had already lived a good chunk of my life [by when the World Wide Web first began][...] Whatever data that would have been generated about me online in the past 10 years or so, it would only represent just these past 10 years."

Some participants specifically mentioned the importance of representation being positive *and* authentic. The tension between positive and authentic (truthful) representation surfaced in the discussions with participants when we asked them what type of data that they wished to leave behind. P8 preferred to be remembered in a positive way through AI-generated media: "It can bring back good memories of past experiences [...] I can be remembered in a good way." However, P12 had a strong preference for authenticity over keeping only happy, positive memories: "I'd rather leave a true image, whether it's good or whether it's bad."

P10 (26 years old) who lost her father as a teenager and more recently, her grandfather, recognized this tension in choosing data to keep with *Memory Swipe*: "I would prefer to pick [data] myself but then because we are biased towards ourselves, it also creates a problem of you showing yourself in the best possible way [...] I would prefer people to remember me as the best possible version of myself but the reality is I know people [have darker sides][...] their darker side doesn't make them any worse of a human and of a person."

Purposely hiding data in order to present only a positive self-representation could also raise concerns among the bereaved. P15, a 34 year old lawyer, worried about how it could appear to a spouse, even with good intentions: "It would be an unpleasant nagging question, an open piece where they would be looking for closure." (P15)

## 7 DISCUSSION

Preparing personal digital data in anticipation of death is not yet common practice. After seeing the complex and nuanced reactions from participants, it is worth critically reflecting on our work and asking once again whether it is worthwhile to create tools to support this practice. Our design exploration suggests that it is indeed worthwhile. Participants responded positively to numerous approaches and many believed that managing data for death is important, welcoming tools in support of this process. We show, however, that no one-size-fits-all approach can satisfy all desires and concerns, a result that extends previous work [40]. Here, we discuss design opportunities for supporting users' diverse practices. We categorize opportunities for exploration based on our research questions.

### 7.1 Normalizing preparing data for death

Through participants' reactions to several concepts like *Made For You* and *Share Forever*, we saw that they felt nudges could fall short when tools fail to account for emotional wellbeing and existing priorities. However, participants were receptive to nudging built into familiar tools. These results can inform more nuanced and holistic approaches that integrate small death preparations into

daily routines. Common actions like sharing photos and videos to friends could be extended to support convenient death preparations. For example, automatic aggregation of any media shared with others into a collective space for meaningful photos, videos, and songs that have been shared over time, so that after death it becomes easily accessible. Online photo libraries already have the ability to identify meaningful data (e.g., a screenshot versus a family gathering photo); a categorization of what is personally meaningful becomes more accurate over time with user input. In contrast, some forms of digital data do not need to be continuously managed such as arrangements of online bank accounts, search history, etc. These types of data may be resolved with one-time decisions, targeting users who perceive death to be far-off, but want to be ready in cases of unexpected accidents or illness. For example, Google's Inactive Account Manager can proactively ask users once a year what they would like to do with their data after death.

Existing workflows for preparing for death, such as purchasing life insurance or writing a will, could be expanded into preparing data for death. This could help normalize preparing data for death, as many of these workflows already follow major life events such as having children, retiring, and dealing with a death in the family. These events could also be opportunities to reflect on the life and afterlife of our digital data. Instead of a frequent practice or one-off choice, certain tasks for preparing data for death can be attached to existing death preparations. But, unlike other types of personal estate, data constantly changes and grows, so infrequent preparations may not be enough to provide adequate preparation (e.g., keeping a list of passwords on paper).

### 7.2 Giving and taking control

Preparation centers around user choices. These choices contribute to the larger framework of maintaining agency over identity [34, 48]. Tools need to navigate the tension between giving and taking control. This points to an opportunity to personalize the amount of control for individual users. Participants discussed welcoming support from AI bots and opinions from loved ones. However, entirely removing the user from the process by fully ceding control to digital tools or other people disrespects user agency. A mixed-initiative approach [28] where users have the final decision is more likely to be adopted: for example, an AI bot that suggests what data to keep or hide. In contrast, tools that automatically aggregate and package data on behalf of their users are convenient, but unlikely to be successful for users who are uncomfortable with losing control.

One possibility is to design an active, evolving space for users to keep what to leave behind. Recent work discusses the purpose of alternative parallel Instagram accounts called "fake instas" or simply "finstas." Users employ "finstas" as micro-sharing platforms for authentic, unpolished content to a chosen group of friends [65]. Similar parallel accounts could be used as collections of cherished digital data to leave behind after death for a select audience. These parallel accounts support granular control over selecting data under an existing mental model of more intimate accounts. The familiar actions of social media activity such as retweeting, reblogging, and reposting content can be extended into the process of preparing data for death.

Participants discussed not knowing the extent of their data as a form of losing after-death control [44]. Learning about where data is located gives control, but mass aggregation of a lifetime of data is challenging to effectively implement and overwhelming for users. Instead, tools could focus on aggregating sensitive data that could be compromised after death. For example, bank accounts and credit card information is often stored across several ecommerce cloud platforms, budget tracking apps, and password managers. Over time, it can be easy to forget where sensitive data is stored. Novel tools can inform users about the many locations of dispersed data.

### 7.3 Introducing collaboration, not conflict

We sought to find collaborative processes by which users could identify what data is meaningful and to whom. In our results, we identified ways that some collaborative efforts could be more fruitful than others. Participants were appreciative of collective repositories of digital data such as *Generation Cloud*. Many cloud storage platforms could be easily repurposed for multigenerational collaboration (e.g., Google Drive, Dropbox). However, having cherished data share space with various other work-related and miscellaneous data may conflict with participants' expectation of cherished data feeling special and intimate. In addition to keeping a multigenerational cloud storage, select cherished data could be transformed into valued physical representations, like a CD of parents' favourite songs from each decade. Many participants felt that physical representations of data, like those in *The Box of Data*, were more valued than virtual digital data, but felt automatic aggregation of their top data, like top 10 liked Facebook posts, were insignificant. Since family repositories are composed of cherished data, adding the option to make data physical can support the remembrance of loved ones.

Although collaboration can be a valuable approach for choosing data, it can be problematic in situations where users feel exposed and vulnerable to harm. For example, the public arenas of social media platforms like a Facebook profile feels too exposed. Until death practices become enculturated, participants will feel reluctant to share information about death preparations on their Facebook or Twitter profiles [47]. We recommend trying to minimize designs that can risk exposing users to vulnerability. For example, tools can respect, integrate, and reflect existing social and emotional dynamics between families, friends, and acquaintances as potential aides for the preparation process.

## 8 LIMITATIONS AND FUTURE WORK

We intended for our sample to be generative, rather than statistically representative. All participants, although ranging in cultural backgrounds, lived in Western countries and as a result, Western cultural norms, beliefs, and ideas around death and technology permeate the study results. Our sample had a relatively small number of older adults (4/20). We acknowledge that older adults are a diverse demographic with individual differences and a larger sample could tease apart attitudes based on socio-technical background versus age effects. The lack of older adults in the ideation workshop may have led to design concepts that better suited younger and middle-aged adults. Future work with a larger sample of older adults can draw deeper comparative insights between older and

younger adults. We particularly encourage incorporating older adults as co-speculative designers to better address their user needs. Novel studies can supplement our work with research to support users with smart assistants, parallel accounts, multigenerational repositories, and automated tools.

## 9 CONCLUSION

Digital data can be meaningful, but is laden with considerations for sharing, deleting, saving, and keeping for after death. We created 12 speculative concepts to elicit participants' expectations around the process of preparing digital data in anticipation of death. Our analysis shows that participants wanted to individually select what to keep but were open to some support from smart assistants, family, and close friends. Maintaining control over after-death self-representation was also important for maintaining a sense of agency, as highlighted by participants' reactions to AI replicas and collaborative games. These results and the design directions we present can help anticipate evolving user needs for how to prepare an ever increasing amount of data distributed across a myriad of services and platforms.

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