

# Understanding Long-Term Interactions with a Slow Technology: An Investigation of Experiences with FutureMe

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## ABSTRACT

Emerging over a decade ago, *slow technology* is a design philosophy aimed at supporting experiences of reflection through and on technology in everyday life. Recent research has suggested that slow technologies can open up new forms of interaction with digital content that support self-reflection and re-visitation of the past. However, little work has investigated people's long-term interactions with systems that embody this design strategy. To investigate, a qualitative study with 31 participants was conducted to understand their long-term experiences with FutureMe—a slow technology that has been in use for over twelve years by more than one million people. Findings reveal that, despite its simplicity, FutureMe produced a range of outcomes—from profound reminiscence to unsettling encounters. Findings are interpreted to present opportunities and implications for future research and practice initiatives.

## Author Keywords

Slow Technology; Temporality; Reflection; Memories.

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

The growing presence of social, cloud and mobile computing has created a world in which people generate, manipulate, and share digital content at larger scales and faster rates than ever before. These new technologies have enabled people to create vast collections of digital materials that capture their life experiences—a valuable resource for connecting with others and reflecting on one's own life [5,16,18,30]. People also now exchange digital content nearly instantaneously across vast distances, generating a sense of social presence and closeness with others no matter their physical location [15,25,36].

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These technological trends have opened up many opportunities to support people in nurturing social relationships as well as contemplating their life experiences. Yet there are growing concerns in the HCI community over how the rapid acceleration of personal digital content production and accumulation might complicate the longer-term significance of these materials. As digital archives grow larger, it becomes increasingly difficult to get a grasp on just how big they are and what is captured within them [33,37]. People's personal digital content is also becoming fragmented across many different systems leading to losses in control over and awareness of these things [27]. These effects can lead to people feeling progressively less interested in engaging with their digital collections, which limits their ability to be meaningful resources for reflection and social connection in the future [18,27,37].

In parallel to these emerging issues, there has been growing interest in how designing for slowness and reflection [9,11,19,20,34] can open up new and radically different ways of engaging with technology in everyday life. Several recent studies have begun to suggest that *slow technologies* can open up meaningful forms of interaction with digital content that support experiences of self-reflection and re-visitation of the past [14,26,35]. However, little work to date has investigated people's actual *long-term* experiences with interactive systems that embody this design strategy.

To investigate these issues, we conducted in depth interviews with 31 participants to understand their long-term experiences with FutureMe—a slow technology that has been in use for over twelve years by more than one million users ([www.futureme.org](http://www.futureme.org)). FutureMe enables people to send emails and photos delayed by to 60 years to their 'future self' or to others. Despite its relative simplicity, findings revealed a range of outcomes emerged across our participants' long-term interactions with FutureMe. This included experiences of reminiscence to leveraging slowness to work through difficult social circumstances to unexpected and disturbing encounters.

This paper makes two contributions. First, it provides rich descriptions of people's long-term experiences with a slow technology. Second, it describes considerations for future research and practice in the HCI community with an eye toward framing interactions with personal digital content within an expanded temporal framing.

## BACKGROUND AND RELATED WORK

Material possessions play important roles as triggers for personal and shared memories; they capture and signify our evolving sense of self and social relationships with others over time. Csikszentmihalyi and Rochberg-Halton [6] articulate the complex ways material things represent the development of life goals and achievements. Belk [3] offers a framework for understanding how people *extend* their sense of self through their things, in part by drawing on them as resources for self-reflection. In parallel to Belk's theorization, McAdams characterizes identity construction as the development of a coherent *life story*—a synthesis of stories uniting events from the past and present interwoven with aspirations for the future [21]. Here, possessions play central roles in pointing back to the past, capturing a current sense of self, and projecting desired futures. More broadly, many others across the social sciences and humanities have investigated the complex roles material artifacts play in supporting memory, reflection, and reminiscence.

Within the HCI community, a growing body of research continues to emerge that focuses on how experiences of reflection and reminiscence can be better supported by interactive systems. Researchers [16,18,30] have presented values-oriented approaches to designing tools to support the archiving of cherished digital content. Several projects have implemented novel ways of embodying and interacting with sentimental digital content [e.g., 10,31]. Recent studies have expanded focus to online environments, illustrating how the generation of digital content through various services can produce meaningful resources for self-reflection and exploration of social relationships [1,5,38].

However, there are growing concerns in the HCI community over the rapid accumulation of digital content and how this trend might complicate the longer-term value of these materials. As digital collections swell in size, it makes it difficult for people to gauge an accurate sense of their size and the memories captured within them [18,29,33,37]. This can make people feel progressively less interested in curating their collections, diminishing their ability to function as resources for identity exploration, self-presentation and reflection over time [e.g., 27]. The proliferation of digital content is also leading to lead to experiences of over-connection [12] and, in some cases, migration away from interactive systems entirely [2].

In parallel to these issues and, in some cases motivated by them, there has been a resurgence of interest in the HCI community in slow [9,11,17,19,20] and reflective [34] design strategies. Here, slow and reflective design share similar aims in their agenda to provoke reflection on one's life and the role of technology in it. On a deeper level, these design strategies present an alternative reconfiguration of human interaction with technology that brings temporality into focus and foregrounds how human-technology relations can evolve over time in rich and complex ways.

Inspired by these design strategies, several recent studies have explored how enforcing longer time periods between the use and non-use of personal digital content may open up new opportunities for reflection and reminiscence. Postulator [14] is an online application that enables people to send annotated images or videos to one's self or others at any point in the future. The Postulator system shares similar ambitions of FutureMe, but to date has yet to be formally evaluated. The Reflexive Printer [35] explores technology-mediated reminiscence by, once per day, selecting one photo from its user's smartphone, physically printing it, and then provoking the user consider whether the digital photo should be deleted or saved. This prototype was deployed in a pilot study with two users over a three-week period where initial findings suggested that the daily material emergence of photos could be successful at supporting reminiscence. The Photobox [26] is a slow technology embodied in the form of a wooden chest that randomly selects and prints a digital photo from its owner's Flickr archive four or five times per month. Three Photoboxes were deployed in three households respectively over a fourteen-month period. Findings revealed a shift in people's attitude from frustration to appreciation as the slow interaction pattern helped build anticipation around when another photo would print and what memories it might contain. These studies are promising; however, they remain small in scope in terms the number of participants engaged and the duration of time people experienced the respective design artifacts.

Collectively, these strands of research have made important contributions to understanding the growing presence of digital content in people's everyday lives. They also reveal that new problems are emerging as the rapid proliferation of digital content threatens its ability to function as a valuable resource for reflection. Nascent research has shown slow technology could be an intriguing approach to mediate and support experiences of self-reflection, contemplation, and social connection. However, virtually no work to date has explored the effect of this design strategy on people's experiences over a long-term timescale. In this paper, we take a step toward addressing this gap by (i) contributing a rich, descriptive understanding of people's long-term experiences of a slow technology aimed at supporting self-reflection and re-visitation of social relationships and (ii) interpreting these findings to frame future research and practice initiatives in the HCI community.

## METHOD AND PARTICIPANTS

FutureMe ([www.futureme.org](http://www.futureme.org)) is an online application that enables people to send emails and photos delayed by potentially long periods of time (from one day to sixty years) to their own email address or the addresses of others participating in the service. After an email is sent, it can never be viewed again until the intended recipient receives it, although the sender retains the option of deleting it up until it is received. FutureMe has operated since December 2002; the photo feature was added in 2011. At the writing

of this paper, over three million messages have been sent by approximately one million users. While other applications targeting slow delivery of digital content exist, none have been used as extensively nor as long as FutureMe. Its widespread use of over the past twelve years presents an unusually rare opportunity to better understand the long-term effects of a much slower approach to experiencing, reflecting on, and sharing digital content.

However, there are a few important things to note about FutureMe. First, it is designed with the intention of supporting the re-experience of digital memories. Thus, our study participants likely already had some interest in engaging in these kinds of activities when they decided to use the service. Second, FutureMe did not support 16-bit character encodings for its first seven years; this largely restricted users desiring to write in Asian languages from participating. Since 2011 access to the service has been blocked in China. Third, users have the option of making their messages public on the FutureMe website where any user of FutureMe can view them. We excluded participants that used this option as it could have interfered with our aim of exploring encounters with digital content from the past that may be highly sensitive, intimate, or idiosyncratic.

A diverse sample of people were recruited for this study to elicit a wide range of rich descriptions of sending and receiving digital content with long periods of non-use in between. This approach does present limitations; for example, it makes it hard to generalize findings to any particular population of people. However, considering the lack of work in this area, it seemed prudent to begin with a diverse group to gain a rich, descriptive understanding of the space as a whole to inform what might be salient issues for future HCI research and practice.

With that in mind, a total of 31 participants (17 female and 14 male) were recruited via online advertisements linked primarily through FutureMe's online forum and its social media feeds (e.g., Facebook). To support our goal of understanding long-term experiences, we required participants to have used FutureMe in some capacity for at least three years. We also required them to have sent or received at least one message delayed by at least one year (although we did not stipulate any requirements beyond this in terms of usage patterns or experience). In this paper, we report on findings related to participants' experiences with digital content that had been delayed by at least one year.

Our resulting sample represented people at different life stages, in many different occupations, and from several different countries. Our youngest participant was aged 23 and our oldest 75 years old (mean=38.8). Occupations included store clerk, schoolteacher, graphic designer, landscaper, retired pharmacist, and university student. Participants hailed from the following countries: 3 Australia, 6 Canada, 2 Mexico, 1 India, 11 US, and 8 UK. All owned personal computers. Participants' computing expertise and practices varied. The majority reported using

email and social media frequently; however, several had much less routine practices of sharing digital content.

Participants were first provided with a brief online survey to gauge their general usage patterns and probe experiences over time through open-ended responses. After reviewing survey responses, we then scheduled and conducted semi-structured interviews with participants, which lasted between 40-65 minutes. All interviews were conducted over video chat in English (with the exception of 3 which were conducted through an Instant Messaging system). Interviews aimed to develop an understanding of each participant's orientations toward a wide range of issues, some of which included their motivations for sending emails, reactions to receiving emails, reflections on the digital content experienced through FutureMe, and potential issues that may have emerged over time. We also probed how their experience of the system may have shifted over time and if interactions with FutureMe motivated any actions or behaviors outside of the application.

All interviews were audio-recorded, which produced 30+ hours of content. Relevant segments of from each recording were transcribed. Notes were also taken during each interview. These notes were reviewed immediately following each interview, and tentative insights were logged in reflective memos [8]. Analysis of the data was an ongoing process. This included repeatedly reviewing notes and tentative insights in an ongoing process to surface underlying themes [24]. Affinity diagrams were also created to reveal connections across participants. Textual documents were then coded using themes. Data were then organized into concrete themes.

## FINDINGS

Through preliminary surveys, participants reported using FutureMe for an average of 6.7 years (min=3, max=11); 5 participants used the system for over a decade. Participants reported sending an average of 18 total messages (min=3, max=67) and received an average 12 total messages (min=3, max=59). All reported sending at least 1 photo since this feature was introduced in 2011.

In the following sections, we present examples and descriptions that help best capture the core themes that emerged in interviews with participants. In this, we refer to each participant with a pseudonym, followed by her or his age and nationality. We begin by describing the various motivations guiding participants' use of FutureMe, from capturing and sharing digital memories to attempts to augment experiences in the future from the past. We then highlight how some participants uniquely leveraged the quality of slowness to work through sensitive personal situations. Following this, we detail difficult to resolve encounters that emerged, which often owed to accounts on FutureMe transcending the lifespan of their owners. Finally, we articulate how, in some cases, FutureMe provoked reflection on the relative state of participants' own digital

collections and the timescales that contemporary digital technologies tend to embody and operate in.

### **General orientations and sensitivities to FutureMe**

While on a general level participants tended to value the way FutureMe operated, many reported experiencing an initial adjustment period to its pacing: *“When I sent my first few [messages], I sat there like ‘ok what now’. ...Even though I knew how it’s supposed to work, I was still expecting something to happen. At that moment I realized how different it is. ...to have to wait for years pass to get feedback from a computer is not a familiar feeling. ...I didn’t see the value at first. Later down the line it’s become captivating”* (Jackie-36-US).

Participants also commented on how the constraints of the system prompted them to create digital content with a deeper sense of consideration and intention. For example, one of our oldest participants connected her experience to the pre-digital era she grew up in: *“Back in my day, people could only write letters. ...You’re writing by hand, so you have to slow down and think and let your thoughts out. You can feel that when you read [a letter]. ...that person is alive with you in the room. Emails and texts don’t hold up the same way. No one devotes the time to be thoughtful. ...This [FutureMe] isn’t like that. If I’m sending it to myself or someone, I know that once it’s sent, it’s ‘out there’ on its way and I’m not going to be able to change it. So, I’d better think good and hard about what’s going into it”* (Bridget-75-UK). In other cases, participants contrasted FutureMe with contemporary digital technologies and services: *“It’s like heaps of [digital] stuff is zooming around us, isn’t it. I get tagged in stuff from parties and shows on Facebook. I don’t see half of it. ...there’s not so much meaning in it, is there. ...I’d say [FutureMe] is different ...not just cause stuff’s way more slow. But because there’s more of a sense of intention behind them [messages]”* (Liam-28-Australia).

Collectively, these quotes help illustrate several ways participants characterized their general orientations toward FutureMe and the effects of its operation on a wider timescale. However, despite FutureMe’s relatively simple characteristics, participants’ uses and experiences of it over time were complex, diverse, and sometimes surprising.

### **Slow digital content from and to one’s self**

The motivations for crafting digital content to send to one’s self in the future centered on two general themes. First, to generate specific records of life experiences or lessons to reencounter years later. Second, to influence future events or behaviors related to one’s life. Unexpected instances also occurred as interactions with FutureMe caused participants to consider their own mortality or they reencountered digital content that had no memory of sending.

#### *Crafting and re-visiting digital records of life experiences*

Participants reported proactively capturing a range of life experiences through digital content to re-visit in the future.

One theme centered on recording events related to professional advancements in the service of generating celebratory reminders of past achievements (e.g., finishing graduate school, receiving a hard earned professional certification). Participants also captured momentous events that were viewed as symbols of personal growth or milestones (e.g., birth of a child, 40<sup>th</sup> birthday). A smaller, yet consistent theme centered on the capture of mundane experiences, such as a record of one’s activities over a given day. Participants speculated that, while ordinary now, this digital content could be a valuable record of everyday life when reencountered in the future.

All but two of our participants had received emails or photos from their past self, and many remarked on their value. For example, Simon-51-US, reflects on receiving 4 emails and 2 photos from himself over the past 7 years: *“I send them [slowed by] 2 to 4 years. ...with that much time any anticipation fades away. That’s how they become remarkable. ...It’s significant to get one. ...In those moments I dive back into life. ...[I] figure out how I somehow ended up ‘here’ today.”* In other cases, participants drew distinctions between the digital content they received through FutureMe and their other digital stuff. Tim-39-US, whom had used FutureMe for 10 years, described annually writing a ‘life synopsis’ of the year’s events and sent it slowed by 1 year. He reflects on the 9 emails he now possesses: *“They’ve grown to become an interesting portrait of who I was and what I was trying to do. None are exceptionally long, but they each speak to different parts of me. ...there are so many photos, posts, feeds... the list goes on. ...but it’s still easy to lose track of how much things change in one year because we’re so focused on what happened today or last weekend. ...These emails are way more valuable to me than 9,000 photos documenting everything that happened in between them.”*

Collectively, these examples help illustrate how the creation, forced non-use, and eventual reencounter of digital content supported experiences of self-reflection. They also reveal how a slower interaction pacing provoked mindful consideration of broader themes within participants’ lives and, in some cases, in ways that starkly contrasted other digital stuff they accumulated over time.

#### *Attempting to influence one’s future life*

Participants also described leveraging the slowed delivery of digital content in concerted attempts to influence future events, experiences or behaviors. The rationale for engaging in this practice varied from the mundane to the extraordinary. In some cases, participants described attempts to positively shape their future mood: *“When I’d be feeling really happy, I’d write down why and send myself ‘a smile’ ...to some random point [in the future]. ...funny enough [getting them] feels pretty natural. ...like how a smell can vividly remind you of a place that lingers for a little while”* (Jessica-27-Canada).

However, we encountered several other cases in which participants' goals had a more serious tone. These instances often centered on providing support for remaining committed to a lifestyle change (e.g., adopting a healthier diet, quitting smoking) or to get through difficult physical or emotional situations (e.g., battling a long-term disease, beating drug addiction). Shannon-29-UK reflects back on many emails she sent in the past (starting 3 years prior, each staggered by 6 months) while in the grips of battling drug addiction: *"Writing those [emails] helped keep me going. When I'd get one, I'd think, 'I can make it to the next one' ...I [still] get them twice a year. ...It's a stinging reminder, but it's good. I don't ever want to be back there again."*

In other cases, participants sent themselves supportive photos or emails that were targeted at a specific future event that they anticipated would be challenging or difficult to overcome. Dylan-26-USA describes receiving an email aimed at summoning courage in his future self to go skydiving and face his fear of heights: *"I listed all the reasons why I needed to do it and sent it so it'd arrive the day before my birthday. ...Sure enough [a year later] I'd been having second thoughts. ...It reminded me why I felt so strongly in the first place. ...I went on with it and I'm glad. ...to me it represents that I'm going to do something if I have a good reason, no matter what."*

**Unanticipated effects of sending slow content to one's self**  
The examples directly above highlight unique and deliberate ways participants drew on FutureMe as a resource to shape experiences in the future—from simply boosting one's mood, to fashioning an ongoing support system dedicated to keeping one grounded. However, in a few cases participants reported unexpected or unsettling experiences emerged from receiving digital content from their past self. The most striking example was Doug-26-US's experience of receiving an email from when he was heavily entrenched in drug and alcohol abuse: *"So, I got it out of the blue. Had no memory of writing it. But I could tell it was me. Didn't make much sense. Only thing that was certain was I was fucked up. ...At first I thought maybe I'd search for some meaning in it, you know like with a dream. ...it was stupid. ...that whole time in my life was meaningless. It was depressing."* In a handful of other instances, participants reported reencountering digital content from their past self associated with life goals that were unattained or had become impossible; most of these instances were deemed undesirable.

Finally, in our interviews, several participants responded with a sense of hesitation when we probed into whether they had sent themselves digital content far into the future. These tensions centered on a general shared perception that sending digital content fifty years into the future can raise an unfamiliar set of concerns: *"It's an amount of time that's hard to get my head around. I mean how would I know I'd even remember it? What if I didn't? What if I'm already dead? Where is it going to go then? I don't think I'd want it*

*to live on somewhere without me"* (Alex-27-US). Alex's statement makes a salient point: even though FutureMe has been used for over a decade, this is relatively little time in the lifespan of a person and it is unclear what could result from encountering digital residue from a time in one's life long forgotten, or for it to transcend one's life entirely.

### **Sharing and receiving slow digital content with others**

Participants reported sending slowed digital content to, or receiving it from, relatives, close friends, significant others, and, to a smaller extent, people they no longer have close social relationships with. Three main themes emerged that broadly characterize these experiences, which are described in combined sections below.

#### *Sharing memories of major or mundane life experiences*

The most common factor that motivated participants to send digital content to someone else was to capture shared social experiences. These kinds of experiences frequently related to major life events (e.g., college graduation, a long awaited marriage) or annual festive events (e.g., Christmas, Seder, a birthday). Emails often aimed to communicate personally significant aspects of events and, at times, to preserve them from being lost over time. Dale-31-US describes sending an email delayed by 5 years to his Dad after attending his parent's 20<sup>th</sup> anniversary party: *"There was this look in his eyes, not just happiness but contentment. I hadn't seen that in a long long time. ...It's something that wouldn't be recognizable in a photograph. ...I didn't want that memory of the way he felt at that exact moment to fade away over time. I wrote him about how he looked and how it made me feel. He should get it right before his 25<sup>th</sup> anniversary."* (Dale-31-US). Participants also commonly described the reminiscent quality of this kind of digital content, which, Samuel-54-Australia characterized as *"well-aged bits that unexpectedly pop in my inbox and take me way back to a time and place that I wish I was in."*

In other cases, FutureMe was used to nurture and signify an intimate social bond between two people. Debbie-45-US, whom had used FutureMe for nearly 10 years, described receiving a message from her sister 8 years ago (which had been written one year prior) that detailed their comically disastrous attempt at painting a house together. She and her sister had since taken to occasionally writing each other 1-3 year delayed emails about other mishaps in their lives: *"it's a truly lovely record of our lives together and apart, richer than any photo album or relic of the past."* In further reflecting on the emergent value of these digital materials, she noted: *"if an archeologist were to find them, I'm sure they'd seem pretty ordinary. ...they represent changes in our lives, but in ways only we'd probably understand."*

However, messages did not always hold the value reflected in the statements above and they sometimes resulted in tensions when events were remembered differently: *"[My cousin] sent me his memory of a camping weekend our families have [each year]. I was like cool, but there was this*

part about how I let our campfire go out one night. But I'm sure he let it go out! I thought he was joking but it turned out he wasn't. It's made me wonder if I'm crazy. ...We still disagree about it" (Javier-Mexico-29). Several other participants described feeling dismayed, confused, and, in one case, confrontational after finding other people's recollections of the past that did not match their own.

*Leveraging slowness to work through issues that 'need time'*  
Participants also described desires to capture feelings tied to a social relationship or experience in the present, specifically with the intention of revealing it at a later point in time. The largest set of participant responses centered on the need to communicate feelings to a person they were no longer in a close relationship with. For example, Amanda-24-US describes the relief she felt after sending an email delayed by 2-years to her ex-partner: "I wanted to wish him well, but whenever I saw him, even if he was just coming online, I was filled with feelings of sadness and contempt. ...It was only going to change with time, and time wasn't moving fast enough. ...I wrote a message that that focused on the positive parts [of our relationship]. ...I sent it knowing he'd get it in a few years, after things mellowed out. ...It was a huge relief. A big step for me."

A handful of participants also described how they leveraged the application to push themselves to work through disclosing sensitive information to others. The most compelling example emerged in Arnold-33-US's description of sending a 2-year delayed message to his parents in which he revealed he is homosexual. "I had been planning to tell them for years but kept backing off. By the time I turned 28 I was like it's now or never. ...I still felt hesitant. ...I never intended to use [FutureMe] to tell my parents I'm gay, but sitting down and writing that message and sending it and knowing they're gonna get it gave me the motivation to finally do it. ...It actually went well. ...I didn't tell them about [the message] and they were pretty touched when they got it."

A few cases also emerged in which participants described receiving digital content that provided the impetus to re-attempt working through a troubled relationship: "When I got divorced, my son and I didn't talk for a long time. I felt like he refused to understand or accept why I couldn't be happy in that marriage. ...I got a message from him. He wrote it 3 years earlier. Reading his perspective on things back then made me see I didn't do a good job communicating. But at that time there's no way I would've been receptive to hearing that. ...It ended up being a step toward us reconnecting" (Roger-49-Canada).

Collectively, these reflections help highlight how participants leveraged the slow, deliberate nature of FutureMe as a resource to mediate intimate and difficult interactions with other people in unique and, ultimately, productive ways. It was clear in our interviews that considerable reflection and work went into crafting the

digital content that was sent or received in these instances. Several other examples did emerge in which other participants described sending time-delayed digital content in the heat of a moment. In many of these cases they returned later to delete them and, in a couple instances, regretted that they had been sent.

#### *Communicating beyond one's own lifetime*

A third thematic issue characterizing experiences of slowed shared digital content centered on the capability to deliver information or materials to others beyond one's own lifetime. These examples ranged from profoundly moving experiences to instances that were troubling and difficult to resolve. The majority of participants reported that at some point they had considered sending emails to others that would be received after they had passed away. During these discussions, participants commonly (and often without prompts) reflected on what it might mean to have some sense of digital agency in the afterlife: "it's attractive to think about, but also very strange. ...to digitally defy time, plan for things to happen after I'm gone" (Selvin-42-India).

The ambivalence reflected in Selvin's statement manifested in several instances participants described in which they had initially created digital content to be posthumously delivered, but later deleted it. The issues that motivated these decisions owed to three main reasons. First, as time progressed, some participants forgot exactly what the digital content they had sent revealed about them. Second, events transpired after the digital content was sent that explicitly made it no longer representative of the sender's perspective. Third, a few participants encountered a negative digitally-mediated experience related to a departed loved one, which caused them reconsider sending posthumously delivered digital content (e.g., a Facebook notification to reconnect with a departed friend).

Nonetheless, a handful of participants had received posthumous digital content, which had since become deeply cherished. For example, Barbara-55-US described receiving a humorous email and photo from a close friend 2.5 years after he passed: "He used to run races in little skimpy pink shorts. That tickled me and he knew it. ...he sent a photo where he's in those shorts with a goofy grin. ...[He] wrote that he's still wearing them in heaven even if it's against the 'dress code.' Ha! what a wonderful reminder of him and his character." In another case, Jenny-27-Canada, reflected on a touching email she received from her father 5 years after his death: "It brought up a lot of emotions ...He mostly wanted to make sure I knew he's still watching over me ...Getting it after such a long time made me cherish the memories of him even more. It's one of the most special things I have from him."

However, receiving posthumous digital content could also lead to confusing and, at times, troubling experiences. Deena-49-UK described receiving a series of images over the course of a few years from her departed uncle that she

struggled to make sense of, and which ultimately motivated her decision to leave the FutureMe service entirely: “About a year after he died I started getting these photos. Nothing written. They’d be people I didn’t know or some place I’d never been. Drove me bonkers. ...Why’d he send ’em? Were they for me? It was right stressful. So I packed up [using it] for good.” Shelly-37-US also encountered an unpredictable series of emails from her departed younger sister that became increasingly difficult to deal with: “Some were about her regrets. Others didn’t make any sense. ...and they keep coming. It’s not like she left a note. It’s haunting. I want to know why she doesn’t want to let things be.”

Collectively, these two examples highlight the complex effects that receiving digital content delayed over varying periods of time can produce, especially when the senders’ intentions are ambiguous. The unpredictable, continued emergence of new digital materials from departed ones that Deena and Shelly experienced produced unsettling ongoing tensions that left them with little choice other than to abandon using their accounts entirely or continue wrestling with ‘haunting’ uncertainty.

#### **Broader emergent reflections and actions over time**

Encountering slow digital content also prompted a range of actions, behavior and reflections more broadly within participants’ everyday lives. Participants frequently described socially reconnecting with people tied to the memories triggered by FutureMe (e.g., through SMS, phone or video chats, face-to-face meetings). It was also common for participants to revisit physical or digital materials tied to past life experiences or social relationships, which they often had not interacted with in years. While these interactions could be highly meaningful, several participants described unexpected emergent complications, which nearly always owed to their inability to locate the materials they desired. While instances did emerge with physical artifacts, the vast majority centered on their digital content and collections. In some cases, these experiences left participants dismayed at the size and state of their personal digital archives: “I got this wonderful email my friend wrote right after we graduated college.... I wanted to look at photos from then. ...I couldn’t believe how hard it was. ...some on my laptop, some on my old computer in the basement. ...I remembered someone posting old photos of us on Facebook but I couldn’t find those either. ...It was a sobering experience. I realized the organization of my digital life is completely out of control.” (Jane-29-US).

Additionally, Deb-50-US reflects on insights triggered by a series of slow emails received from her son: “I was thinking about them [emails] while looking through [physical] photo albums I made as he grew up. ...It dawned on me how they are good markers of points in his life, kind of like how a photo album is. But, you know, they’re still just an email, only one thing. They don’t have the depth like an album does. ...Then I got thinking about how I don’t even have the digital photos that would provide that same kind of

experience. ...they’re all over. ...I’d have to dig through old folders and that’s just the beginning.”

Despite these issues, most participants reported highly meaningful experiences emerging from interactions with FutureMe. Interestingly, however, when probing deeper in the interviews, perceptions differed to some extent over having what was often regarded as extraordinary digital content embodied and stored within an email: “Email is extremely useful. It’s also bland and unexpressive. ...so when I think about having things that I treasure, ...things I want to have forever. I feel like I need a different format.” (Alex-27-US). Similarly, Samantha-UK-34 noted: “they are gems, they are, really, but my email [account] is a rubbish dump, and that doesn’t feel quite right at the end of the day” (Samantha-UK-34). Interestingly, a handful of participants reported explicitly valuing having their slow digital content become introduced into their email stream: “I don’t mind, it’s how memories work. They’re all fleeting. ...Of course I enjoy engaging with them but then more [emails] pile up, they get buried, slowly disappear.” (Jessica-27-Canada). Kate-37-US desired to have even more control over her digital content fading away: “If I can decide when it’s delivered in the future, I should also be able to decide when it will vanish for good. ...Even though it’d be gone, it might still stay with me or it might not. Having that impermanence would be meaningful.”

Finally, several discussions emerged in which participants reflected more broadly on the quality of their long-term interactions with FutureMe. For example, Terry-44-US reflected on the trajectory of his decade-long experience: “The world was such a different place when I started using it. ...No Facebook. No Twitter. Things were busy, but they didn’t feel as fast moving. ...[FutureMe] is so simple. It doesn’t ask anything of me. I can leave for it a year or two or longer and come back to it. ...That’s why it still feels relevant and authentic. These are hard to find qualities in the digital world these days.” Dale-31-US similarly perceived value in the slower, yet deliberate way FutureMe operates and it’s long-term potential: “I barely ‘use’ it, but at the same time I don’t feel like letting it go. I want it for the rest of my life ...because it’s working in a timeframe that’s on a whole other level. It’s one that technology doesn’t engage much but I think there’s benefits to having something focusing on the long-haul and having to think about things in that way.”

#### **DISCUSSION**

It is clear that creating, re-encountering or experiencing digital content through a slow technology can produce complex effects. A key contribution of this study is to present rich descriptions of what these effects are and how they shaped people’s experiences over time. While its functionality was both limited and simple, participants drew on FutureMe for a range of purposes—to generate unique resources for self-reflection, to influence events in the future, and to nurture, work through, or reflect on intimate

social relationships. Interactions with FutureMe led to a range of unexpected experiences, and catalyzed reflections and actions beyond the digital content it delivered. Ultimately, FutureMe was capable of triggering a spectrum of experiences—from poignant moments of beauty and epiphany to humorous flashes to unsettling encounters.

Collectively, this diverse collection of accounts builds on and extends prior works by providing new insights into the potential benefits and tradeoffs bound to the long-term use of a socially situated slow technology. Prior slow technology systems aimed at reflection and reminiscence, such as the Photobox [26] and Reflexive Printer [35], operated completely autonomously, re-presenting users with photos from their past. In both cases, these design artifacts enforced periods of non-use between each photo—ranging from one day to several weeks—in the service of slowing interaction patterns and building anticipation around what might be encountered next. In contrast, the much longer enforced timespan we explored in FutureMe—where messages were delivered at minimum one year from when they were sent—caused participants’ anticipated future experience of the system to fade away entirely. It became clear that this effect created an added sense of gravity to the experience of receiving a message. In several cases participants reported that this long time lapse led them to attribute an extraordinary or remarkable quality to the digital content they received. More broadly, the seldom yet persistent emergence of messages paired with the intentional, targeted nature of digital content crafted through FutureMe appeared to further amplify experiences of surprise and mindfulness of the past in ways that could trigger deep contemplation or simply linger momentarily.

However, these qualities also led to instances in which people’s recollections of past events deviated from the digital content sent through FutureMe in strange and curious, if not unsettling, ways. These instances parallel earlier research describing how re-encountering unexpected digital materials from one’s past can trigger a sense of re-accountability over experiences that had been reconciled and put to rest [13]. Our work further reveals tensions that can emerge when the agency to unpredictably introduce ‘well-aged’ digital traces into one’s life is extended to other people. These tensions were especially amplified in cases where participants were burdened by receiving confusing or ambiguous digital content from departed loved ones. These instances exemplify the *asymmetrical* nature of posthumous exchanges of digital content where people can be left with an unsettling responsibility to come to terms with things communicated to them from the departed, despite having no clear way of resolving them [22,29]. As slow technology systems continue to emerge, there is a clear need to develop strategies for striking a balance between offering better methods to contextualize digital exchanges over long time periods, while also avoiding over-complicating the value and richness that often emerged from crafting messages the relatively simple way FutureMe operated.

On a broader level, FutureMe emerged as a unique example of a slow technology that resonated with earlier articulations of this interaction design philosophy [11]. Its functionality and design qualities enabled it to easily fade in and out of perceptual view over considerable amounts of time. Interactions with the system provoked mindful consideration of participants’ lives, their technological habits, and even their relations to other contemporary domestic technologies. And, as experiences slowly accumulated around FutureMe, the uniqueness and character of people’s relation to the system manifested through its temporal form [20]. Taken as a whole, findings from our study of FutureMe suggests further design considerations that can guide future research and practice initiatives in the HCI community, which we turn to next.

## DESIGN CONSIDERATIONS

**Exploring divergent design strategies for supporting reminiscence through slow technologies**—Interactions with FutureMe catalyzed various rich moments of reflection, which, in several cases, triggered participants to search for other physical and digital materials related to particular memories captured in the digital content they received. In many of these cases, participants encountered complications, often becoming overwhelmed (and at times surprised) by the vast unstructured and fragmented nature of their personal digital collections. These tensions are reflective of growing concerns in the HCI community over people’s increasing loss of control over and awareness of their digital content, and the critical implications this suggests for its long-term significance [27,33,37].

However, design strategies for productively engaging with these growing problems are sparse and underdeveloped. One key reason owes to the complexity of separating and collating people’s meaningful (and often highly idiosyncratic) digital materials from their trivial things [18]. While not explicitly designed for this use, the nature of digital content generated through FutureMe tended to provide a unique index (or “good marker” as Deb-50-US noted) of significant points in people’s life (whether mundane or extraordinary). While it is not our intention to suggest slow technologies like FutureMe ought to be augmented per se, the information or metadata captured through their use could be leveraged outside of the system to index, collate, combine, and re-form various other kinds of digital content (e.g., photos, music, video, audio, messages) related to a particular life experience, period in a social relationship, or otherwise memorable event. These assemblies of digital content themselves could emerge slowly over time, potentially forming into rich digital representations of one’s life. This design direction could potentially alleviate some of the conflicting tensions participants experienced that centered on having deeply cherished, digital content embodied and often stored in the banal form of an email. Emerging research exploring the convergence of online and offline digital content could be



leveraged in support of this direction [e.g., 27,38], as could work exploring the embodiment of sentimental digital content in radically new and engaging forms [28,31].

Nonetheless, it seems crucial that this approach is handled cautiously. It was evident that participants did not always desire to re-encounter digital content from the past (even if they themselves produced it). Participants also held differing perspectives on the appropriate treatment of digital content they received. Some found its placement (and eventual ‘fading away’) in their ever-expanding email archive was suitable, while others desired for more expressive and deliberate ways of instilling a sense of impermanence in these digital materials. These instances highlight the importance of supporting a wide range of perspectives and desires when designing slow technologies and, more generally, social media systems. Emerging research that proposes decay as a metaphor for design [10] as well as new approaches to digital file dispossession [23, 32] could guide future research aligned with this direction.

**Envisioning the long-term role of interactive systems in mediating intimacy**—This study also revealed various ways participants leveraged FutureMe to mediate intimate interactions with others. As messages or photos accumulated over time, deeply valued digital records of one-to-one relationships surfaced. Participants also leveraged slowness to work through social relationships that “needed time.” While subtle, this emergent use of the enforced timespan of non-use afforded by FutureMe provided a crucial support mechanism to give participants the inertia needed to move on from difficult situations. In this, it led to experiences of personal growth and catalyzed slow steps toward resolving a troubled relationship.

However, intimate exchanges with loved ones could also be disrupted through FutureMe. As noted, this was most evident in cases where departed loved ones were, in a sense, digitally re-animated by the system and participants continued to receive ambiguous, difficult to resolve posthumously sent messages. One pre-emptive strategy to address these tensions could be to design subtle features into future applications that enable people to inscribe short annotations to clarify or contextualize their reasons for sending a time-delayed message. This intervention could help support the sender in remembering what was sealed away in a message written long ago. More importantly, it could help clarify the intentionality behind why a message or series of messages were sent. It could also be beneficial to complement this approach with an intervention that enabled the receiver of unsettling messages to ‘mute’ or opt out of receiving further correspondence from a particular sender. We see this combined direction as paralleling efforts to develop sensitive, values-oriented approaches to dealing with the digital detritus left behind by people as the longevity of their digital accounts supersedes their own lifetimes [4,7,22,29].

On a higher level, our findings present diverse and, at times, unexpected ways FutureMe opened up intimate interactions along a wider temporal framing. The HCI community has long explored the design of technologies that compress space to mediate a sense of social intimacy with others. This body of work has adopted a wide range of materials and modalities, from the direct and synchronous [25] to the tactile [36] to the indirect and minimal [15]. However, virtually no work has explored the issue of designing technologies to mediate long-term intimate interactions. The rich descriptions from our study arguably give more weight to questions that have to date only been explored on conceptual or speculative levels in HCI. For example, what kinds of experiences could unfold if one was to re-encounter a ‘haptic kiss’ recorded and sent from a loved one (or an ex-lover) 20 years in the past? What if it could only be experienced once? Or, a different kind of digital assemblage followed it at some point in the future? What is clear is that the time has come to more critically consider the actuality of these interactions and the implications that they suggest for the field of HCI. They do, after all, represent major opportunities, issues and consequences that the HCI community will inevitably have to face.

## CONCLUSION

This paper has reported findings from in depth interviews aimed at understanding participants’ long-term interactions with FutureMe—a rare example of a slow technology that has been widely used over an unusually long time period. Findings revealed that, despite this technology’s limited functionality, it produced a spectrum of experiences and effects. Based on these findings, we have discussed and outlined several considerations for future research and practice initiatives. This paper presents one of what are many approaches needed to unpack the complex and profound implications that result from people’s long-term interactions with interactive technologies. We hope this research will be a step toward influencing future initiatives in the HCI community that bring the subject of human relations with technology over time more seriously into focus, now and long into the future.

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