

Legacy in the Age of the Internet: Reflections on How Interactive Systems Shape How We Are Remembered

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ABSTRACT

The creation of a personal legacy is a process through which information, values, and memories are passed down to future generations. This process is inherently subjective, both as a curated collection of the elements of one's life, and as an evolving form of remembrance that is subject to the interpretations of those to whom it is left. Based on directed storytelling sessions with 14 adults from a large Midwestern city in the United States, we explore users' perceptions of how their use of digital systems and information will impact how their lives are interpreted and reflected upon by their families and by future generations. Our findings describe nuances regarding how shifting notions about technological systems and the long-term accessibility of digital information impact the ways in which we share, and subsequently manage, information online. This work, explored here in the context of legacy, exposes opportunities to help users engage with their digital information through the curation of meaningful records, the dispossession of digital debris, and a reexamination of how digital systems and services influence the accessibility and lifespan of digital information.

Author Keywords

Digital inheritance; personal legacy; digital identity; family; identity management; design; digital forgetting.

ACM Classification Keywords

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

INTRODUCTION

The creation of a legacy is a dynamic and subjective process through which information, values, and memories are passed down to future generations [24]. As a purposeful curation of the components of one's life, a legacy is influenced by how its creator would like to be remembered. Typically, in constructing a legacy, people emphasize the

artifacts and memories that highlight meaningful aspects of their life [48]. After a person's death, that legacy is then subject to the interpretations of those to whom it is left [48]. A legacy is also colored by existing notions held by the receivers of that legacy and by the uncurated artifacts that are left behind. As a result, long after a person has passed away, a legacy can continue to evolve to reflect a changing understanding of that person's life and values.

As people increasingly utilize interactive systems to share, record, and reflect on their lives and experiences, it is important to consider how digital information might influence both how we curate our legacies and how we are remembered. Prior work has focused on tools and perceptions related to the deliberate curation of digital media and information. Several related strands of research have emphasized developing systems that enable people to archive and manage aspects of their digital life [15, 27], better engage in meaning-making with digital information [36, 42], and reflect on their family's digital history [19, 31]. Building on this emerging body of work, we explore the topic of personal legacy with a broad focus regarding ways in which people share digital information. We are specifically interested in engaging with the ideas of personal or familial legacy, but do touch on how these concepts might relate to broader concepts like cultural legacy.

In the service of capturing a more holistic notion of one's digital self, our inquiry explores both accounts and information that are tied to one's real name identity and those that are in some way held apart from one's real name identity. This latter category includes digital identities and accounts that are private, that people separate from their anchored networks [49], and those that they have abandoned over time. Though these accounts may not comprise the primary identities users put forth online, they are increasingly becoming an indelible part of a person's digital history [39]. However, there is uncertainty regarding how these types of accounts might be accessed and interpreted in the future; the unintended discovery of information held in them has the potential to influence, and perhaps complicate, the legacy a person intended to leave behind. Furthermore, the ease with which people archive and distribute digital information makes it difficult to

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DIS 2014, June 21–25, 2014, Vancouver, BC, Canada.

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ACM 978-1-4503-2902-6/14/06...\$15.00.

control (or even understand) the context and lifespan of information shared online [18].

Through 14 directed storytelling sessions with adults from a large Midwestern city in the United States, we explore how people perceive the lifespan and impact of the digital information tied to their real name, and that which is held in their private, hidden, and abandoned accounts. We also investigate people's expectations for how the heterogeneous pieces of their collections of digital information will be managed, accessed, and interpreted by future generations. We describe how digital systems shape the accessibility, use, and abandonment of one's information, the ways in which people manage and assess non-active digital information, and people's perceptions of how that information might change or be valued in the future. With these findings in mind, this paper contributes a novel, in-depth exploration of how a person's collection of digital information, including that which falls outside of one's active, real-name identity, might be seen through the lens of a personal digital legacy. These findings have broad-ranging implications with regards to how systems, societies, and individuals will grapple with the long-term implications of digital information.

PRIOR WORK AND RELATED LITERATURE

Though there is some cultural and personal variation, the process of crafting a legacy generally involves the elevation of artifacts, values, and memories that signify the ways in which a person wants to be remembered. People often seek to downplay the presence of artifacts and ideas that do not support the identity they hope to leave behind [48]. This curatorial process involves the bequeathing of one's things as a way of living on through the memories or values that they signify [5, 38]. The creation and dissemination of a legacy serves several purposes, such as enabling a person to reflect on their own life experiences, emphasizing relationships with significant people or institutions, and providing an opportunity to shape how their life will be reflected upon [26, 48].

As people use interactive systems to capture meaningful memories and experiences, researchers in and outside of the human-computer interaction (HCI) community have begun to study the role that systems can play in the curation of a legacy and the remembrance of a person's life [28]. The struggle to manage personal digital information is well documented, and stems from several causes, including the scale of the information we produce [46] and fragmentation across devices and systems [10]. As an emerging practice, it remains unclear how the digital records that people generate will play into existing practices related to death and remembrance [32]. Although we know that people do place value on digital information [8], many qualities of digital information contradict commonly held understandings of what makes physical objects valuable [33]. Inconsistent policies from service providers and lawmakers also make it difficult for users to understand how concepts like

ownership and inheritance apply to digital accounts [22]. This uncertainty is significant given the diverse ways people use interactive systems to capture and share their lives.

The topic of legacy is strongly tied to how people construct and present their identity, which is influenced by their understanding of their own identity, the context and settings in which they interact with others, and their interpretation of their audience [17]. This practice evolves as we age—as young adults, we learn to tie together aspects of our lives to develop themes that reflect our interpretation of our behaviors and life's experiences [30]. Ultimately, this process culminates with the development of generative motifs focused on being remembered positively [30].

Building on this foundational work, there is a large body of research exploring how people construct *virtual* identities and what influences their choices to share specific types of information through different online aliases. These identities, and the differences between them, are often a reflection of broader phenomena such as aging and the development of one's social networks [14]. Outside of real name accounts, the use of anonymity and pseudonymity online can be motivated by social factors such as the desire to avoid criticism and maintain a professional identity [6]. Furthermore, identity construction online is strongly shaped by the systems we use to establish those identities [21].

Privacy concerns also influence how people decide what to disclose online. The notion of privacy in the online world is complex. Digital privacy is subject to changing notions about what constitutes public and private spaces online [25] and to users' conflicting desires to build relationships through disclosure, while avoiding potential repercussions of sharing sensitive information [1]. Furthermore, digital information is reproducible, making it difficult to control the contexts in which it is accessible [18]. Thus, it becomes difficult for users to estimate the impact of privacy breaches, or even know when breaches occur [11]. This is further complicated by technical developments that directly and indirectly subvert online anonymity by leveraging aspects of a person's digital footprint (e.g., IP address) to establish cohesion across different online identities [37]. Despite these challenges, many people have developed their own models to control the disclosure of their information to online networks [43].

There are several HCI-oriented research projects that explore how digital information is shaping practices related to death, legacy, and remembrance. Odom et al. presents research on a collection of technology heirlooms that explore the complexities surrounding how digital information becomes a cherished part of a family's shared history [27]. Researchers have also investigated how once-active digital accounts are repurposed as memorial spaces after the owner has passed away [e.g., 4]. Walter et al. articulated how technology is shaping the nature of how we die and mourn [46]. Though their work is oriented toward

public, anchored identities, it artfully unpacks how people engage in meaning making with digital information and the role it plays in how people are remembered.

Collectively, this literature highlights a key tension: by documenting life experiences online, people create indelible and often unmanageable records of their experiences [38]. Accordingly, researchers have begun to examine what it might mean to develop new practices, such as deeply forgetting [3, 29], to support the dispossession of digital artifacts and information. Our work brings these strands together: we investigate how the creation of a digital legacy, intentional or not, might affect how people are perceived in the near and distant future.

FIELD STUDY METHOD

Participants

We recruited a diverse sample of participants to investigate how their online accounts and information might shape the construction and representation of their digital legacy. This approach has some limitations, as targeted recruiting of particular extreme user groups (such as people who only communicate online using anonymous accounts, or who are deeply invested in the process of managing their own digital records) might have yielded further insights. However, we wanted to begin with a diverse group to gain a rich, descriptive understanding of the space to inform what might be salient issues for future research.

We recruited 14 participants (eight men and six women) from a large Midwestern city in the United States through online advertisements, neighborhood list-servs, and flyers. Four of our 14 participants were recruited because they self-identified as people who had accounts that were abandoned, secret, private, or separated from their real-name identity and networks. Though all participants engaged in these practices to some extent, we recruited these four participants to ensure that we could explore a more diverse collection of the ways in which people utilize online systems to construct their identity and share information online [35].

Potential participants were screened to ensure our sample was diverse in terms of age, occupation, marital status, educational background and technical proficiency. Our youngest participant was aged 20 and our oldest was 50 (the median age was 29). Seven participants were single, one was divorced, and the remaining six were married. Participants had a variety of occupations, including waitress, teacher, and health care worker; two participants were unemployed. Three of our participants had jobs related to information technology. Several of our participants were tech savvy, and described utilizing a host of online tools to share information with friends and create digital media. Nearly an equal number were skeptical about the role of technology in their lives and took a measured approach by attempting to limit the types of information that they shared and that was available about them online.

In-home Sessions and Digital Account Inventory

For privacy considerations, we conducted the interviews in participants' homes when other residents of the home were not around. Because our interviews dealt with potentially sensitive topics, we adopted an approach combining directed storytelling and open-ended interviews. The interviews covered a series of topics about the participants' use of digital accounts and networks over time, perceptions of how they present themselves online, experiences managing digital information, and assessments of the lifespan and potential impact of their digital information.

Directed storytelling is a method that employs prompts to encourage people to share stories about their experiences [20]. For example, participants were asked: "Can you tell a story about a time when you removed information that you had posted online?" When integrated into an open-ended interview, this technique can help participants productively engage with and reflect on their past experiences. Furthermore, asking participants to tell stories about their experiences helped establish rapport and lessen their hesitancy to answer personal questions.

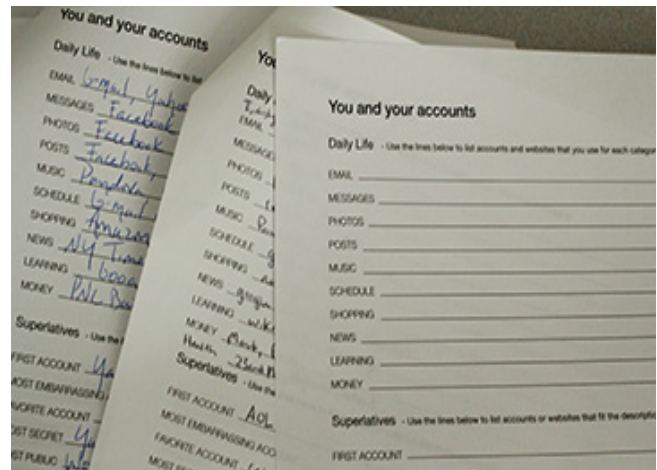


Figure 1: The digital accounts inventories used in the study.

The interview sessions lasted between one and two hours and followed an open-ended discussion guide, including questions that covered topics related to how participants identify themselves online, their experiences managing their digital information, and their perceptions about what factors will influence the longevity of their digital information. Additionally, we created a digital accounts inventory for participants to fill out at the beginning of the sessions. This inventory (Figure 1) had three sections: (1) an elicitation of a list of the websites and accounts participants used for everyday activities (e.g., messaging, banking, and listening to music), (2) questions prompting participants to assign superlatives to valuable, private, or significant accounts, and (3) an elicitation of what accounts and services were connected to their social networks. This inventory was not intended to be comprehensive, nor was it used directly in our analysis. Instead, we designed it to provoke participants to consider and reflect on the breadth

of digital services they have used over many years. This activity served as a starting point for discussions about the ways in which participants construct and perceive of the boundaries surrounding and among their online identities.

Data Analysis

Researchers recorded and transcribed each interview session. Then, the research team followed a grounded theory approach to create an open coding scheme for our data that reflected the phenomena described by participants [7]. After each draft of the coding scheme was completed, we reviewed the ways in which the data was represented by that scheme and made changes based on that review. Our coding scheme underwent several iterations and was ultimately comprised of 52 codes distributed across nine categories.

FINDINGS

In each section of the findings, we describe a particular behavior or perception, and reflect on that concept in the context of how it might impact the creation of one's legacy. In what follows, we refer to participants by number, from P1 to P14.

The interviews and digital accounts inventories revealed a range of online accounts utilized by participants to manage different aspects of their lives online. All participants used computers on a daily or weekly basis and all had a web history of some kind. All participants had used websites in which personal information was collected, such as Facebook or Yahoo Mail. Some, particularly our four youngest participants, were web savvy, though an approximately equal number of participants used their computers in less sophisticated ways—primarily as a portal for sending and receiving email. Several websites—such as Facebook, YouTube, Gmail, Yahoo, and reddit—were well represented across our participants. We also asked our participants to describe two types of accounts: those that they were embarrassed by and those that they kept secret. This category was largely comprised of accounts on dating websites, email, forum, and chat accounts that were deliberately created as secret accounts, and accounts on blogging websites.

Outside of these major services, there were a number of individual differences between the accounts that each participant reported using, which help illustrate the diversity of our participants' online lives. For example, while one participant described a number of meaningful accounts that were linked to his interest in music and his performances, another participant used online services primarily as a means to find employment.

Identity Management in the Context of Digital Legacy

Engagement with Real Name and Active Identities

While identity construction and information sharing online [13, 44] are well documented in prior literature, our findings examine and reflect upon how these phenomena might shape one's personal digital legacy. All of our

participants described ways in which meaningful aspects of their life were not captured or shared online. Additionally, because of the trend towards connecting with people using real-name identities, there was apprehension about sharing information that might have broad-reaching or long-term impacts. We are particularly interested in this topic as it may have significant influence on how a person's life is interpreted by future generations. As people increasingly use digital platforms to share, record, and archive information, it is imperative that we reflect on how gaps in one's digital information may influence how that person is remembered.

Participants described diverse and individually significant aspects of their lives that were not readily knowable or recordable by digital systems, making them underrepresented on digital platforms. Examples provided by participants included key components of one's personality, communication between family, close friends, partners, and spouses, and the day-to-day reality of one's life. P2, explaining his assessment that his digital accounts represented only a small portion of the information about his everyday life, said: *"Like, I'm not trying to say that you'd only get a 3% picture of who I am, but like, probably much less than that, probably less than half a percent, less than a tenth of a percent. It's kind of hard to, someone's inner monologue only occasionally escapes and ends up as a comment somewhere..."*

These participants confirmed that, to a large extent, information that was not being captured through digital services was not being recorded elsewhere such as in a journal. Of course, some of this uncaptured information is represented by means other than formal physical records or readily accessible digital records. For example, a couple might not have a strong digital footprint for the details of their relationship but might have accumulated many physical mementos that reflect their life together. Similarly, a deeper analysis of aspects of one's digital life, such as a person's connections on social networks, could also help future generations develop a better picture of one's close relationships. Clearly, the tools and mechanisms we develop to curate our digital lives for long-term archiving would benefit from the ability to help users understand and harness the potential of their digital records.

Beyond the incidental gaps that result from the nature of one's relationship with their friends and family, there were also many examples of people who purposefully withheld information because of concerns about self-presentation. Ten of fourteen participants expressed concerns about the risks of using digital systems to share provocative or potentially harmful opinions. Talking about how his role as a semi-public political figure had influenced what he shares online, P4 remarked: *"I mean I, now that I'm involved with city council, ...I try to be careful about how I present myself publicly. Which is very hard for me, because I kind of like, I can't remember what it was but I came up with a joke*

earlier today that was hilarious but completely inappropriate. I wanted to badly to publish it but I was like ‘I can’t let that reflect on the [people] I work for and stuff like that.’” Consequently, these provocative, personal, and often-revealing aspects of a person’s life were offloaded into accounts and spaces that are more difficult to connect back to that person. In so doing, they were effectively removed from the publicly available or easily accessed information about that person.

Clearly, these gaps and omissions could have a major impact on how a person is remembered. The sharing of content online has created a series of practices that make it difficult for people to express and record viewpoints that they are afraid will reflect poorly on themselves, and which may lead them to be ostracized by others in their social networks. Despite the risks of sharing this type of information, viewpoints, interactions, and information contradicting commonly held beliefs about what is ‘acceptable’ or ‘right’ might be a telling and valuable piece of information as future generations look back on one’s life, especially as viewpoints on particular issues change over time.

Abandoned, Private, and Deleted Identities

All of our participants described having accounts that were once prominent but had since been abandoned or fallen into disuse. Though some of these abandoned accounts were later deleted or deactivated, in all cases, the abandonment and the loss of digital information has an impact on the types of information available in one’s digital records as it can negatively impact the accessibility and availability of some part of one’s digital records.

Identity presentation online is complicated by the ways in which both a person’s pre-existing digital records and the systems through which they share digital information influence how they are perceived. In some cases, a person’s digital records play a meaningful role in their ability to participate and contribute to an online network. That is, when available to other users, these records can impact both how a person will behave and how others perceive him. As expected, many participants had taken steps to distance themselves from accounts that might cast an unfavorable light over their present-day interactions online and offline. Though offline interactions are subject to the same influences of older interactions, this is of particular concern with digital systems because of the uncertainty regarding the accessibility and context of digital records and information.

Eight of fourteen participants described the abandonment or deletion of an established online account, which was typically because the account no longer reflected how they wanted to represent themselves either on or offline. P7 described having developed a blogging persona through which she wrote about a difficult year she experienced both personally and professionally. She continued to use this blog until she felt that it was no longer representative of

her: “things are starting to go better with like job and love life and things. I don’t feel like I need it anymore.” In a similar vein, P14 described his embarrassment about an account he used as a teenager: “Which I think is exactly what I’d see if I looked at my old chat logs, [that] I was dumb or I was vulgar, or something” but noted that he was not alone in having felt embarrassed by accounts created when he was young. In both of these cases, participants chose not to delete these accounts. Instead, they distanced themselves from the information, while the accounts continued to persist online. In both cases, the participants were still able to access the information but were not sure about how long they would allow that information to stay online nor how possible it would be to completely distance themselves from it.

Similarly, five of our participants described having created accounts in response to major life events — such as moving to a new city, looking for a new job, or a health crisis — which eventually fell into disuse. P6, reflecting on the chat account she created after a vocal chord surgery said: “I had a really big surgery in 2009 and I was laid up and my vocal chords after the surgery were paralyzed and I couldn’t speak to anybody. ... someone said, ‘You should just go in a chat room and type away.’ And that was how it started.” During this period in her life, the account provided an outlet for her to connect with others. However, once her speech was restored, it was subsequently abandoned and was later lost completely when Yahoo shut down their chat service. These types of accounts are idiosyncratic, but highlight how abandoned identities can be valuable resources as a snapshot of a particular time in one’s life. However, almost none of our participants retained the ability to access these types of accounts, either because they have forgotten their login information or usernames, or because they deleted the accounts when they no longer served a purpose. For the accounts that were not deleted, the abandonment of those identities makes it uncertain whether the information held therein might be accessible in the future and whether it will be possible to connect that information back to a person’s more prominent accounts and identities.

Systems and the Accessibility of Digital Information

Systems as Unseen Partners

When asked to reflect on the lifespan of their digital information, participants described how the systems and service providers that hold their digital information have a large influence over whether that information remains accessible over time. One result of this perception was that nearly all participants found it difficult to assess how long their digital information would be available online. In some cases, this ambiguity was a result of past experiences using services that had faded from popularity or had been shut down: “Like how long is Facebook really going to be popular? ...Or is it going to be like MySpace, where these are just sitting out there and no one uses them. Or even the blog, how long will it be sitting there. Forever? I don’t

know.” – P7. In another example, P6 described her expectations about the lifespan of her digital information: *“I’m assuming [my information will be available] forever unless Facebook shuts down. I wrote a letter to the editor in the 80s and its still on there... [I think] that it’ll be on there forever and when I’m long gone dead buried and ashes there will be some reminder that I was here.”* Uncertainty related to the lifespan of digital information is a critical issue in two regards: how people weigh the potential consequences of sharing personal information online and whether the information they have shared will be available to future generations.

It was clear from these conversations that many of our participants did not feel as though they were the primary agent in deciding how long their digital information would be available online. Participants questioned the motivations for services like Facebook and Gmail to archive a person’s digital information: *“Yeah, um, I would think that people [should] have more control over the quality of the archival on their personal archives and formats and the like public stuff you know, how long is Facebook gonna give two shits about somebody’s pictures from 2 years ago?”* – P8. Even when discussing options for the safe-keeping and archiving of one’s digital information, there was an emphasis on looking for systems that could fulfill that need: *“If there was like a digital will, last will and testament or something I would try to make use of it.”* – P2. This feeling of disempowerment and dependence on digital systems also pervaded conversations about the difficulty of managing undesirable information that was available online: *“[I didn’t] like finding things about me on Google, but it’s not removable.”* – P1. Conversely, several of our participants described having had accounts that were shut down by a third party, such as college and work email accounts. These are immensely important considerations regarding how we conceptualize the role that systems play in the maintenance of digital records.

Systems as Generators of Digital Debris

The internet also exerts a strong influence on our digital records through the proliferation of services and contexts that necessitate the creation of new user accounts. There are extensive amounts of both (1) systems that, for reasons related to identity presentation, drive people to create additional accounts to express potentially damaging information, and (2) systems that require users to create a new account to access their service. On reddit, for example, it is common to create an anonymous “throwaway account” in order to share private or potentially damaging information. As P12 observed, *“There’s things sometimes you’re signing up for, [and think] this should be a throwaway account. This is the browser game for command and conquer, this is only going to be interesting for 24 hours.”* This was emphasized when, during our interviews, almost every participant asked to make additions to their digital accounts inventory after remembering an account they had forgotten to include. Systems that encourage the

creation of throwaway or temporary accounts represent a significant challenge for users as they try to conceptualize where their digital information is located and who has access to that information.

Systems as Mediators of Digital Identities

Norms about sharing and identity online have shifted over time. Previously, it was common for people to employ a pseudonym as their primary identity online. P13, describing a long-held username: *“It’s nice, it could probably easily get traced back to me but it’s nice to have some degree of anonymity and removal from [my real name], I find it, it’s kind of intriguing.”* Today, many services like Gmail and Facebook require users to provide their real name and share information under that name. Though these policies are difficult to enforce, they have shaped norms about how people identify themselves. In this way, these policies are part of a larger trend we observed in which people tended to move away from utilizing primarily anonymous accounts online towards establishing a real-name online presence. While thirteen of our participants reported utilizing pseudonymity or anonymity to share some information online, all of them described having their real names associated with accounts such as Facebook and email. These accounts were the primary ways in which they shared information online. Seven of our participants talked about the professional importance of maintaining a curated, real-name identity online. As there are significant differences in the types of content people are comfortable sharing with anchored, pseudonymous, and anonymous networks, this shift significantly shaped how participants create, utilize, and manage their digital identities.

Technological shifts also play a major role in the abandonment or deletion of digital accounts. In some cases, this is due to identity presentation – people did not want to be associated with an old or unfashionable technology. P7 described this feeling: *“I used to use Yahoo as my main account, but now everyone uses Gmail.”* In other cases, shifting from one system to another was a response to new technologies providing a better service to users. Four of our participants explicitly described having switched to a new digital account because it offered better features or a better experience. Though users expressed feeling a strong connection to particular user names or accounts, the experience of interacting with a digital service can have a strong influence on a person’s decision to maintain or abandon that service.

Legacy Making with Digital Information

In the final portion of our sessions, we asked participants to prospectively reflect on their long-term plans for the management of their digital records. These discussions surfaced their impressions about what, of their large quantities of digital information, might be worth saving, archiving, or passing on to future generations. It also touched on how participants perceived the differences

between the lifespans of their public and private information.

Building on Existing Practices

When asked to think about what digital information might be worth saving, it was common for participants to frame their answers in terms of current practices regarding the bequeathing of one's physical things. Participants spoke often of the desire to save correspondences, such as through email and forums, drawing analogies to physical records and media. P2, describing whether he'd like to save his digital information, said: *"I mean, people read their parents letters to each other, to other people and know who they were. I'd say it's important to me."* P4 used similar language when describing posts he'd made to a forum: *"A lot of people kept their correspondence in the [time] previous to this time, when people actually wrote letters to each other. I mean those [posts] were essentially like, some of those were like short letters."* Given uncertainty regarding how digital information might play into one's legacy, it follows that participants might look at established practices to make predictions about what might be valuable. In addition, this focus on personal correspondences points to particular areas of one's digital life that might merit additional consideration with regards to archiving.

Information Accessibility

Thinking more broadly about the implication of one's digital records, participants described what information they would like people to have access to and how their digital records might play into that desire. On one extreme, P6 was strongly opposed to the idea that anyone might have access to her records after she'd passed away: *"I don't want anyone in my digital stuff. Not in my underwear drawers, nothing. It's a weird thing."* She felt that enabling others to access her digital records would be a violation of her privacy. Though she was the only participant who was wholly opposed to this concept, numerous participants described the ways in which they hoped their digital records provide a curated or filtered view of their life. P5, describing his hope for the lifespan of his digital information, said: *"...if I regret something, I don't want to keep it as long."* However, as described in a prior section, participants were quick to note that they might not have control over the lifespan of their digital information.

Speculation about the future

As many of our participants described having abandoned, deleted, or edited older online identities, we were interested in their perception of how the ways in which they present themselves online might change in the future. We therefore asked our participants to speculate about the types of changes they might make to their digital records as they got older. This inquiry yielded a diverse collection of responses that generally fell into one of two categories: (1) the belief that one's digital records would evolve over time in response to changes in one's life, changes to the technology that they use, and a desire to organize one's digital information; and (2) the belief that the highly curated nature

of one's digital records lessens the need to deliberately make major adjustments to those records. However, in both cases, there was clear uncertainty, particularly when discussions were framed in the larger set of curatorial behaviors and actions that had already been undertaken by our participants with regards to their digital records and accounts. In short, it was difficult for participants to pinpoint any particular predictions about their future interactions through and with their current digital identities.

DESIGN IMPLICATIONS AND OPPORTUNITIES

The creation of a digital legacy is a complex process, and the rapid growth of technology is increasingly intersecting with it in profound ways. A key contribution of our study is to provide insights into how the range of digital information about people's identities that proliferates on the internet might influence how their lives are interpreted and reflected upon by their families and future generations.

It is clear that users struggle to manage their digital information, that one's digital information can provide a distorted representation of that person's life and values, that systems themselves play a large role in the lifespan of the information they contain, and that users are uncertain about how to conceptualize the role that digital information might play in how they are remembered. Based on these findings, we describe a number of systems, interventions, and augmentations of existing practices that begin to address the need for more thoughtful engagement with how people's digital records will serve as a part of a meaningful legacy left for future generations.

In the section that follows, we identify opportunity areas related to legacy making and digital systems. Inspired by the work of Sas and Whitaker [40], the ideas put forth there are not intended to be prescriptive. Instead, they are written to highlight and reflect upon the complexity of how both users and systems are engaged in the long-term management of one's digital information. The first – *cross service identity curation* – focuses on the opportunities and challenges associated with developing services that can help users manage disparate pieces of digital information. The next – *capturing, revealing, and cleaning digital debris* – discusses the creation of systems and practices that help people engage with the dispossession of digital things. Finally, the third opportunity area – *supporting cultural legacy making* – examines the potential societal value of maintaining and analyzing large collections of digital records.

Cross Service Identity Curation

Within the larger collection of information a person has shared online, there are identities, spaces, and networks that can serve as valuable representations of notable periods in their life. Currently, the information held in these kinds of digital identities is lost when a person's use of that identity ceases. After an account is no longer in use, there is currently no widely established cross-service mechanism for users to archive the information held within or to

maintain access to that information over time. As a result, a substantial amount of a person's digital history is lost, either because she or he can no longer find or access the information, or because the system itself has been shut down by a service provider.

There is, however, clear value associated with holding on to some of a person's digital information as a way of gathering pieces of information that tell a story about a person's life. Similar to emerging critiques of the life logging perspective [e.g., 42], we are not arguing for all-encompassing life-archiving systems that mystically pull together all of the aspects of a person's online life. It is difficult to anticipate what exact accounts and digital representations of a person will be meaningful for future generations. However, there is clear exigence for the development of systems, both digital and physical, that enable users to curate, elevate, and archive digital systems that played a meaningful role in how they interacted with others online, how they shaped their identity, and that are imbued with the experiences of particular life stages. These types of systems could also have value as a tool that exposes users to the idea that their digital information may have an impact on how they are remembered.

In addition to providing a space that supports this curatorial process, new systems could be designed that implicitly advocate for the value of the information and virtual possessions kept in one's digital accounts. In comparison with the physical practices and artifacts surrounding the representation and curation of one's legacy, people have not fully integrated digital information into their conceptualization of what they will leave behind to future generations. Our findings illustrate that it is not yet common for people to think about the long term, legacy-oriented implications of their digital information (except for limited cases related to financial digital information). We are at the outset of these practices, which suggests a clear opportunity for designing new interactive systems that are aimed at better fostering the creation of expressive and meaningful digital legacies.

However, it is essential to critically consider potential unintended consequences bound to this emerging design space. New systems and tools could enable the creation of more valued and interwoven digital legacies, but they would necessarily make connections among previously disjointed areas of digital information. This could expose users to identity theft and cause breaches between established online networks and identities. In addition, this may threaten the use of truly anonymous accounts.

Capturing, Revealing, and Cleaning Digital Debris

Correspondingly, there is a need for further mechanisms that enable people to divest themselves of digital debris. We refer here to information and identities that are the by-product of contemporary internet use. As described by our participants, these include accounts that users were forced to create in order to access a website (but that were

abandoned almost immediately thereafter), information collected about a user without their knowledge, and accounts that are made to share some limited or relatively meaningless piece of information.

In this case, we propose two complementary strategies. First, there is an opportunity to support practices that reduce the amount of digital debris that is created. As an example, a potential avenue for this is to advocate for the utilization of generic, empty accounts that a person can use in lieu of creating new, meaningless accounts. In practice, savvy internet users can already find websites to which people have submitted account names and passwords that they can use for themselves, most commonly when accessing content held behind a pay wall. However, these practices are not widely known and numerous legal and ethical issues are tied to their use. Increasing numbers of websites now also allow users login access by virtue of their Facebook or Google account. While these authorized logins prevent the need to create new accounts, they may also expose a user's data to third parties. As a result, there is an opportunity to create systems that enable people to have greater agency in deciding where and when they share personal information online. Additionally, there may be value in systems that advocate for the use of pseudonyms to limit the exposure of personal information. Such systems could productively aid in reducing the scattering and fragmentation of a person's digital information [33].

There is also the opportunity to capture and address digital debris after it has been generated, an initiative that could take many forms. One such example would be to create a database of instructions to help users navigate the process of shutting down unwanted accounts. Another is to create a system that could automate the process of revealing one's unused or abandoned accounts, and providing both technical and emotional support for deleting or deactivating those accounts. Nonetheless, the development of such systems is complicated by the idea that users may not be able to predict what digital accounts might be valuable in the future and what they might lose by deleting particular pieces of digital information.

Supporting Cultural Legacy Making

Finally, in addition to the meaningful domain of personal and familial legacy, there is an opportunity to reflect on how digital information might be integrated into broader concepts like the heritage or legacy of an entire culture. The promise of enduring and widespread accessibility of digital platforms makes the digital realm an attractive option for the preservation of both physical and digital cultural artifacts and information [1, 23]. However, as noted by Friedman and Nathan, the preservation of digital information is a complex issue fraught with challenges that stem from uncertainty regarding the long-term ownership and management of digital information [15].

Beyond structured preservation projects being undertaken by cultural institutions like museums and libraries, we

argue that digital information and systems could also contribute to a body of cultural knowledge by: (a) allowing individuals, rather than institutions, to construct and share their own interpretations of things of cultural value, and (b) providing a way to retroactively capture and organize information about people, events, or artifacts of cultural importance. Building on growing digital literacy and access, digital systems provide a powerful medium for individuals to advocate for their perspective on what matters in their culture and what should ultimately become that culture's legacy. These efforts are, of course, subject to similar concerns regarding the role of systems and users in the preservation of that information. But, nonetheless, they highlight the opportunity to create systems that grapple with questions of ownership while also enabling individuals to be actively engaged in the process of identifying and sharing information of cultural significance.

CONCLUSION

We investigated how the increasing proliferation of online accounts and personal content are shaping people's identity practices online and how those practices might shape the digital legacies left behind. We identified findings and design opportunities about online information, including digital records outside of one's active, real-name identities and examined how those might be seen through the lens of digital legacy. We critically considered the potential benefits and dangers of designing new technologies intended to better enable people to reflect on their digital identities during various life stages and to play a more central role in constructing their digital legacies. Our fieldwork presented complications participants faced when coming to terms with their online digital records, practices developed to navigate these tensions, and issues that remain unresolved. Based on these findings, we have described opportunity areas related to the curation of one's digital identities, the revealing and cleaning of digital debris, and cultural legacy making. We hope this study inspires further research into how technology can support the construction of meaningful and long-lasting digital legacies.

ACKNOWLEDGMENTS

This work was supported by an NSF Graduate Fellowship – NSF 0750271 – and by the HCII at Carnegie Mellon University. We would like to thank Aisling Kelliher, Steven Dow, John Zimmerman, Min Kyung Lee, Sunyoung Kim, and Queenie Kravitz for their support and their contributions to this work. We also thank the people who welcomed us into their homes and shared their experiences with us as a part of this study. Finally, we thank the many reviewers who provided excellent feedback.

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