Co-constructing Family Memory: Understanding the Intergenerational Practices of Passing on Family Stories

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ABSTRACT
Sharing family stories is an integral aspect of how families remember together and build a sense of connection. Yet, when generations in families are separated by large geographic and temporal distances, the everyday taken-for-granted processes of sharing family stories shift from conversational to mediated forms. To inform HCI research and practice in mediating family stories, we contribute an account of the co-constructive intergenerational social practices enacted to co-construct and interpret family stories. These practices demonstrate the agency of both storytellers and listeners as they work to discover, decipher, and reconstruct family stories. We close by drawing insights from this setting to frame key design challenges for multi-lifespan information systems mediating asynchronous, asymmetric, co-constructive and socially weighted information sharing interactions.

Author Keywords
Memory; family; family memory; family stories; storytelling; intergenerational; digital memento

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

INTRODUCTION
The memories of our family ground and guide us in our everyday lives. Memory influences our identity, our sense of belonging in the world, and the ways that we relate to events throughout our lives. The memory we have of our own lived experiences shapes our personalities, actions, and relationships. The memories of the communities that we are members of, including our families, shape us as social beings and situate us in a particular sociocultural instance in history [47]. Family stories convey the shared, ongoing narratives of family memory, persistent beyond any single member, that a family builds to create a sense of collective identity and connection across multiple generations.

CHI 2018, April 21–26, 2018, Montreal, QC, Canada

ACM 978-1-4503-5620-6/18/04...$15.00
https://doi.org/10.1145/3173574.3173998

Today, there are many challenges for families, and larger communities, to build their collective memory across generations. Especially prevalent in the U.S. are situations where different generations in a family are separated, whether by migration, disaster, or other reasons, and unable to share their memories through the conversational, in-person storytelling that characterizes much of family communication [48]. Additionally, changes in family dynamics, such as children born later into the lives of their parents, have destabilized the everyday, taken-for-granted opportunities for different generations to meet each other.

In the absence of face-to-face communication and opportunities to interact with their descendants in person, older family members rely on communicative artifacts, such as written memoirs or audio-recorded narratives as "vehicles to 'pass on' memories that would otherwise be lost" [24]. Digital storytelling and online oral history platforms, like StoryCorps or LegacyStories.org, have been gaining popularity as technology-mediated ways to record and preserve family memories. In addition, HCI researchers have generated extensive design work on novel interactive devices to digitally capture and access personal stories ([2,6,13,32]).

Yet, while these platforms provide means to store and access content, they do not fully support the range of interactions that family members have with each other, as well as with preserved content, to pass on their family stories. In particular, few of these works engage with the theoretical understanding of family memory as "a negotiated process of sensemaking" [28]. Our paper advances the idea that both older and younger generations are actively engaged in the communicative processes of collective remembering. In particular, we draw out how storytellers and listeners both actively engage in cross-generational practices to discover, decipher, and reconstruct family stories.

Attending to these interactions and practices helps us to build an understanding of the ways that family storytelling *happens,* which is an important element in HCI/CSCW research, especially for systems that operate in complex social settings [21,37]. Further, a deep understanding of practices is essential for creating technologies that are "unremarkable," that is, so seamlessly integrated into people's activities that they become normalized and taken for granted [37]. To our knowledge, there has not yet been a

full account of the collective practices which families engage in to pass on family memory that would inform and direct design work in this space.

The contribution of this paper is an intergenerational account of how memories are conveyed to future generations through family stories. This description of practices grounds our analysis and provides contextual insight for future design work. In our discussion, we draw connections between design for family memory and the design challenges of "multi-lifespan information systems" intended to convey information and facilitate social interactions with this information over multiple generations of users [12]. We close with proposals for future work to support the co-constructive and interpretive practices of passing on family stories to future generations.

BACKGROUND AND RELATED WORK

Our work is informed by theories of family and collective memory, studies of family history work, and prior work in technologies for social reminiscing and digital legacy. Memory is a popular topic that has received significant attention from diverse angles and perspectives. We focus in this section on literature related to family stories and related memory sharing practices.

Theoretical Framing of Family Memory

We approach family memory as a form of collective memory, which is the memory of a group that transcends the personally remembered experiences of its individual members [17]. When describing how collective memory is created, scholars use the term "collective remembering" to emphasize the nature of memory as a process: an ongoing collective engagement and interpretation of the past [42].

Family memory, or remembering, is unique from other forms of collective memory due to its emphasis on individuals, the strong "allegiances" between members that identify as part of the family, and its strong emotional dimension [11]. It is also intergenerational, "constituted through ongoing social interaction and communication between children, parents and grandparents" [11]. Family memory is comprised of communicative elements, like family stories and inherited knowledge, as well as cultural elements, like heirlooms and rituals [1]. These different elements are analytically distinct but overlapping in practice. The distinctions become further blurred in the context of "mediated memory," where stories and other information are inscribed and preserved in records, text, images and other information artifacts.

From these definitions, we frame the passing on family memory as both process and product, consisting of the activities of remembering and the products constructed through this remembering. In our attention to family stories, we focus on how family memory is enacted through multi-generational practices to produce family stories.

Family Memory Practices

Prior ethnographic studies in HCI, CSCW, and information behavior on family memory and family history have espoused a processual, practice-oriented view regarding family memory (e.g. [20,31,38,41,43,45]). From these, we learned that family memory involves a significant amount of information work, and that this work is pursued by people, in part, as a search for meaning through learning about their family's past [45]. Studies of family history researchers focus on understanding the information-seeking behavior of people interacting with records, archival institutions, and with other information seekers [44]; how people navigate personal meaning-making and the demands of public history resources [23,45]; and the conflicts that can occur in open contribution platforms [43].

Lindley [24] also contributed a foundational study on the motivations of grandparents passing on family stories through memoirs. She noted that as interviewees created their memoirs, they also took on the responsibilities of a "steward" to act on behalf of the family rather than on their own interests. The responsibilities of maintaining the content, significance, and accessibility of the memory artifacts they inherited also influenced the ways that they envisioned their own narratives. We build on this literature by investigating how these responsibilities are carried out in the practice of storytelling and expounding on the participatory role of "future generations" in these practices.

Mediating Family Communication Over Long Distances

Research in HCI and CSCW has addressed many of the emerging challenges of connecting families over distance through custom communication systems. Systems provide better multi-modal, multi-party communication platforms for families living apart (e.g. [7,46]), ambient awareness to highlight opportunities to connect to loved ones (e.g. [8,18]), and increased accessibility to foster a sense of connectedness across generations (e.g. [40]).

However, design for *intergenerational* family memory must address family members separated by both geographical and lifetime-spanning temporal distance. This context poses several unique challenges that distinguish it from other research in connecting families: 1) The timescale of passing on a message may be very long, years or even decades. 2) There may be no ability or expectation of response (especially if the person sharing dies as their message waits to be passed on). In this case, there is no ability to confirm that a message was received and understood. 3) Because memoirs are intended for often-ambiguous "future generations," the person sharing their memories may not have a clear idea of the audience with whom they are sharing. Likewise, the recipient(s) may have no personal knowledge or direct relationship with the sender.

These challenges, which are characteristic of family memory, require a specialized approach for the design of systems that support asynchronous, asymmetric interactions. One approach to mediating long-term

interactions has been proposed in the concept of multi-lifespan information systems [12]. A multi-lifespan approach to design starts to grapple with the social and material implications of technologies that carry information into the future beyond the lives of their owner or original users. These include issues such as decay and obsolescence, future unknown users, and evolving contexts of use. We expand the issues that must be considered in such systems, drawing from our context of sharing intergenerational family stories, to shed light on the work and values at play for the many users who must prepare, pass on, and receive information shared over multiple generations.

Technology-Mediated Family Stories

The current trajectory of research in HCI has generated extensive insight and work towards creating devices and systems for mediating what might be known as memory artifacts (saved content, traces, triggers, and reminders). We will describe some key software tools and systems that facilitate family stories and storytelling as direct predecessors of our work.

There have been efforts to help people share stories about their past, including devices to promote in-person storytelling about the past [39], and tools for organizing and discussing genealogical information [5,35]. Another approach, which focused on older adults who might not have anyone to talk to, was to develop systems that provided access to responsive listeners, either artificial agents or real people (e.g. [10,33]). Another approach has been to provide or propose narrative scaffolding tools to assist people in digital storytelling using their collections of photos, videos, and text (e.g. [22,25]).

A slightly different orientation are designs that use digital multimedia to explain the significance of physical objects, such as with recorded stories that are digitally linked by methods like RFID or QR-codes (e.g. [3,4,13]) or associated with photographic images (e.g. [16,26]). Digital content could also be linked to real-world contextual triggers, like location, to organize and bring up stories about the past at pre-determined points (e.g. [6]).

Yet, the memorial use of digital information and interactive technologies has also been met with suspicion by older adults. Thomas [36] conducted a focus group study to examine how older adults viewed new and emerging legacy technologies (such as QR-coded tombstones and lifelogs) for preserving their memories and life experiences. While older adults saw some value in preserving information about themselves after their death, they viewed some of the systems with suspicion, worrying that their information might be used inappropriately in more public settings or that more interactive interfaces were an "indulgent" way to be memorialized. Part of the discomfort that people have with these systems may be because legacy technologies operate on an incomplete picture of family memory. The values enacted through memory sharing practices, especially those carried out for future generations, are not well-understood and thus not accounted for in the design process or in designed products.

Summary of Contribution

This body of prior work has addressed the ways that the "stuff" of family memory can be mediated through physical and digital technological artifacts and has yielded important insights into the goals and purposes of sharing memories for the family. We contribute to this literature an account of the future-focused motivations and practices that drive older and younger generations to collectively co-construct family memory through stories for the next generation.

METHODOLOGY

To unpack the practices of intergenerational family memory, we sought the dual perspectives of people filling the roles of "tellers" and "listeners" in family storytelling. "Tellers," for the purposes of this work, are family members in an older generation who shared about their family's past from their experience and from inherited stories. "Listeners" refers to younger generations representing the envisioned recipients of family stories.

Participants

We recruited 21 people in "teller" or "listener" generations in their respective families. We interviewed 10 primarily older adults as tellers who were actively researching their family history and endeavoring to create some comprehensive record of their family stories for future generations {Age 50's-80's; 5 women; IDs: Eli, Karen, Vivienne, Caleb, Joe, Oscar, Barb, Lilian, Alina, Robert}. One participant in this interview group was younger (Eli, early-thirties), but was referred to us by another teller because he spent several years of researching his family's origins and was writing a book for his family. None of the participants in this group were professionally trained, although two (Joe, Caleb) ran a small consultancy providing memoir preservation advice. We also interviewed 11 younger adults as representatives of "listener" generations {Age 20's-40's; 8 women; IDs: Kristine, Tina, Anne, Lisbeth, Gloria, Lincoln, Evan, Larry, Janine, Maggie, Marie}. Several of these younger participants were interested in learning more about their family, but none were actively engaged in family history or genealogical research. Much of their perspective was about their experience hearing stories about their family.

Participants were recruited through local community organizations, cultural centers, and universities through emails, network contacts, and word-of-mouth. We selected participants who had spent most of their lives in the U.S. but, as is common among American families, many traced their heritage to a diverse array of different countries around the world. Eight of our participants (4 younger generation, 4 older generation) were first-generation Americans with some extended family living elsewhere.

Data Collection and Analysis

Our interviews were semi-structured, allowing us to take a more guided conversational approach. We asked

participants to tell us an interesting story about their family and followed up with discussion about how they learned what they know about their family history. Follow-up questions included: How did you learn about this story? Has this story changed over time? Do other members of your family know this story? We also asked how they hope to share their knowledge with their future descendants.

We did not define "family", "memories", or "family stories" to our participants to let them speak about their experiences from their point of view. We believe the similarities we saw in our data across interviews, despite the open-endedness of the discussion lends validity to our attempt to abstract these practices. For example, all of our participants indicated their conception of family went beyond traditional "nuclear" family to include grandparents, cousins, grandchildren.

We asked all participants to reflect on their experiences as listeners and tellers in interviews. Younger participants in general had more to say about their listening experiences than their telling experiences, but their comments contributed important insights to help us understand the process of how people navigated these roles.

Data Analysis & Theoretical Framing

All interviews were audio-recorded and transcribed by the first author. To help make sense of these experiences and perspectives in our data, we drew on Wertsch's theory of collective remembering to develop our practice orientation to family memory [42]. We employed a qualitative, grounded theoretical approach, informed by situational analysis, to inductively analyze our data and generate the findings and insights of this study [9].

Interviews from each set of participants (teller and listener generations) were coded individually according to the activities discussed in the interview, and grouped these activities into emergent themes across interviews to describe similar practices, motivations, and challenges. We report on a subset of these themes which describe the processes of how people come to know a family story and how they intend to pass it on.

We illustrate these themes in our findings section to ground our analysis of the values at play in this setting, as well as to inform and inspire fruitful direction multi-lifespan information sharing. As a note, although we recruited participants under this teller/listener framework, we learned in early interviews that these roles are fluid and interconnected. This was especially salient for older participants who could recall their experiences both as tellers and listeners. This understanding did not change our interview structure, but we incorporated this fluidity into our analysis. Thus, in our findings, although we identify participants by their recruited role (T or L), illustrative quotes present the specific perspectives that the participant was recounting (listener of the story vs. teller of a story), rather than the role in which we recruited them. Quotes have been anonymized and lightly edited for clarity.

FINDINGS

In this section, we describe our participants' motivations and the key activities they undertook to learn and pass on family memory across generations. We describe first the sense of duty— either to oneself or to future family members, that participants expressed when asked about their motivation to learn or share. The activities our participants recounted included actively working to discover stories from different sources, deciphering stories to make sense of the content and meaning, and reconstructing stories according the goals and needs of current and future listeners. We highlight these sets of practices as a foundation for informing designers who seek to address challenges that different generations in families might encounter when they are unable to share face-to-face.

Enacting a Duty

When asked to consider what interested them in learning about their family's past or about passing on family memories, participants' main motivation was to make the past more relatable: to *"humanize"* their ancestors, share their appreciation of the people they had known, and to remember the things their family had done in the past.

Participants in both generations also spoke about sharing their family history with a sense of duty. Oscar, an active family historian in his late 60's, shared that he thought he should research his parents' lives because *"that experience was my experience."* Evan, a young adult in his mid-20's who was starting to ask questions about his parents' lives, shared a similar sentiment:

It's something I should know about-- to understand. And not knowing-- it seems kinda lazy. I don't know how to else to describe it other than it just feels like that's something you should know about yourself if you have the option. (Evan, L)

Participants in older generations also perceived an obligation pass on their knowledge to younger generations. As Caleb, a grandfather, emphasized, *"They've gotta know. They've gotta be exposed to the stories."* Vivienne shared her perspective as a mother, arguing that these stories were important to share because current and future generations were directly impacted by those events.

I think that what happens, even 5 generations back, has an effect on your life today… It still impacts you, and I think it's important to know the family history. …I do think it's important that future generations know who you were, how you thought, how you lived, that kind of thing. (Vivienne, T)

We highlight this sense of duty and responsibility that directed many of our participants as an impetus beyond personal interest. The sense of duty served as a motivation for them carry out significant, *"damn time-consuming"* amounts of work.

Discovering the Story

Many of our participants were trying to gather more information and family stories, both for their own benefit and to augment the knowledge they were able to share with their families when they retold these stories. This search to discover their family stories occurred when participants did not have the opportunity to live with and exchange memories more conversationally with older generations. Our participants described proactively drawing out stories from older family members, finding people with some knowledge, trading information with other families, and carefully regarding the boundaries other family members had around sensitive topics.

Drawing out stories

Participants who were in search of a story were looking for information sources to help them build a complete picture of the past person or event that they wanted to know about. However, even given the chance to talk with an older family member, sometimes, they *"didn't have a story to tell" (Tina, L).* There were some common, quintessential practices that participants talked about, such as *"asking questions*" of an older family member know or *"having conversations"* with a person who had a story to tell.

Although actively drawing out a story could be more work for a listener, Lisbeth saw this as an opportunity to craft her own narrative from the memories shared by her ancestors:

You get to drive the story. You get to build it by asking questions. You keep asking questions until that thing in your head has a shape. … with my grandmother, I would kinda keep pestering and asking things until I was satisfied with whatever I understood. (Lisbeth, L)

In this dynamic of *"driv[ing] the story,*" Lisbeth, as a listener, had more freedom to build the stories she wanted from the stories she was told. In this way, family stories were mutually constructed by tellers and listeners as tellers shared their experience and listeners provided the interpretive scaffolding through their questions and subjective understanding.

Finding People

The direct personal accounts of people were highly valued by our participants. Yakel [45] similarly notes in her work on amateur family history researchers that although people had access to archives, public records and other institutional resources, they primarily sought information from their social networks. Personal accounts, for our participants, contained more *"personality"* than official records, and conveying a sense of the personality of ancestors was a key motivation of participants to gather and pass on these stories. However, sometimes the relative in question was inaccessible because they had already passed away or due to language barriers or estrangement.

When information could not be found among family members they knew, some participants sought out people from outside the family to help them learn more. For example, Karen shared how she gathered information about her late grandfather's life through as many people as she could. She had recently discovered an old family friend who, now as an elderly man, was one of the few remaining people with a living memory of him.

I met a man my age who used to escort my grandfather down through the woods to church every Sunday. … So, I told him, I want you to call me and tell me some more stories... (Karen, T)

Other participants also shared their experiences discovering people, or being contacted themselves by other seekers who knew about a relative they were investigating. We note that participants often did not know who they were looking for or even what they hoped to find out. From examples of wandering through graveyards and crashing weddings and funerals among the more extreme activities participants were driven by a desire just to find someone with a memory of any kind.

(Dis)Regarding boundaries

In their quest for family stories, our participants were mindful of the impact these memories could have on the relatives they sought out. Listeners showed a range of ways that they addressed sensitive topics, such as emotionally fraught memories and subjects that were considered off-limits for casual discussion. While some people tried not to bring up topics that would cause controversy, or *"pull up any skeletons,*" other participants dismissed those concerns in the face of their desire to learn more or to build a fuller account for their descendants.

For example, Karen described her efforts to convince older members in her family to share the details of a family secret that she was investigating. Karen was creating a family biography and had found photographs of a *"mystery relative"* among her family portraits. These pictures alerted her of the possibility that there was a hidden story, however, older family members would not disclose how this person was related. Karen thought the information in this hidden story was more important than the social or cultural concerns that prevented it from being shared. However, her desires to learn more were countered by relatives who did not wish to share.

I just want to be able to link as much information as possible. … And that's what I've got to get people to understand, that was five generations ago. Can we just dispel the myth and the mystery and just put it out there? …Back then it was a taboo, but now it's so commonplace. (Karen, T)

Karen felt that this hidden information was preventing her from creating a full account of her family's past. In this particular case, Karen decided to record as much as she knew, leaving the mystery for future descendants.

The discovery practices that our participants described showed that family memory sharing involves a significant, active effort by those in listener roles. Listeners sought out answers to questions, people with direct experience, and sources of complementary information, all while navigating

potential taboos and boundaries. Each party in these memory sharing interactions – listeners and storytellers alike – were active agents, although sometimes with opposing preferences. In the next section, we discuss the practices that participants employed to understand and interpret what they had learned.

Deciphering the Story

In many cases, found or inherited stories about the past needed explanations to make sense to current listeners. Due to cultural shifts over time, migration to different geographic areas, or language differences, sometimes shared stories might be illegible in the present. In conversational storytelling, these breakdowns might be repaired through the kinds of direct question-asking that we saw in the prior section. However, these direct explanatory practices are not possible when the stories are shared in a mediated form, like written text or recordings. The challenge of these mediated forms of sharing stories are exacerbated, yet largely inescapable, over the long timespans of multiple generations. To illustrate, we highlight key anecdotes from our participants to shed light on more commonly encountered challenges of understanding the context, translating the medium into a more legible form, and identifying past alterations.

Contextualizing the story

Context, or the supporting information that helps to interpret the meaning and significance of a memory, can be lost when the teller and listener are not similarly situated. For example, when members of a family moved to a different region or living environment, the activities remembered might no longer take place, and their meaning in a family story might be lost on listeners. This is true for changing locale and also for cultural changes over time.

To illustrate the loss and repair of often implicit context, we refer to a family story Gloria shared about a time when her grandfather broke his arm as a boy while playing. Gloria valued this glimpse into her grandfather's life, but did not completely understand the setting he described.

[My grandfather] told me about a time he was a kid, and he broke his arm because he and his siblings were jumping off the barn into bales of hay, and he missed the hay a little bit. … At first, I didn't realize there was a bale of hay there. Grandpa just told me he broke it jumping off a barn. And I was like, "Why were they jumping off the barn?" (Gloria, L)

Because Gloria had not grown up on a farm like her grandfather, she did not have the common experience and knowledge needed to infer these details and make sense of her grandfather's story. She could not ask her grandfather to explain further because, he *"didn't like to talk about himself."* Instead, she turned to her mother, who had spent time in her grandfather's childhood home, to explain.

[My mother] said, "Everybody did it, I did it." And I was like, "What?" She said, "Yeah, you jump off the barn into a big hay stack or a bale of hay." And I said "Oh, there's a bale of hay," [chuckle] 'Cause I didn't grow up in the country.… (Gloria, L)

Without the proper contextualization, a relatively mundane children's game became to Gloria *"the craziest thing I ever heard of."* Differences in common knowledge or familiar experiences across generations (and even within generations) required additional narrative explanation to help the listener gain a full understanding of the story being passed down. But the original storyteller may not have the forethought to add these extra details, and may be unavailable, or unwilling, to contribute this extra information. This can lead to many of the discovery practices we outlined in the last section as listeners try to make sense of the stories they have been told.

Translating the media of the story

Several of our participants came from families that had extensive written records ranging from personal journals, to daily planners with jotted notes, to an old heirloom "family Bible" with genealogical information. Yet, despite the efforts of prior generations to prepare this information for their descendants, it could become effectively useless when there were difficulties in translating the content.

We note these difficulties, and the concomitant translation practices, in response to the worries of older adults regarding the accessibility of digitally preserved mementos reported in related studies (e.g. [14,30,36]). Especially pervasive are worries that rapidly changing digital formats would render recorded content unreadable in the future. From our participant's experiences, we point out that these problems transcend digital vs. analog.

For example, Vivienne faced an issue where her ancestors had left behind meticulously handwritten records, but in a language she did not speak. She no longer had close relatives who could translate the records, and she knew it would be quite expensive to have it done professionally. Without an idea of the content's significance, she struggled with how much effort to invest to decipher it: *"I don't know whether it would be worth it or not." (Vivienne, T)*

All media intended to convey information for multi-lifespan scale periods of time, across generations, will require some translation by each generation of listeners to convert it to a more accessible and relevant format. Regardless of the medium, it is important for tellers to communicate the *significance* of the memories they are passing on. Knowing the significance of the information could help future recipients decide whether to invest the effort of translating.

Recognizing past alterations to a story

In addition to re-contextualizing and translating information passed down in family stories, a third key effort was recognizing when a story, or some of its details, had been changed by someone before. Storytelling yields a certain amount of variability as people add their own flair. This kind of versioning was known and expected among participants. As an elderly grandmother, Lilian, quipped,

"Accuracy is not the goal." However, as we saw earlier, family stories were often sought out for informational purposes as well as for the sense of connection to the past. When significant details were omitted, added, or changed, they could alter the tone or meaning of a story. Significant changes could cause it to fall under question as a veridical account of the past.

For example, Maggie, a young listener in her twenties, shared about a time when she had started to question stories about her heritage that she learned from her father. She described a cascading series of doubts about his *"Irish story"* that led her to conclude that aspects of her family's origin story were not quite true. First, Maggie recognized inconsistency between her father and her uncles' accounts, where, *"[My dad] says that he's second generation from Ireland, but then some brothers will say other things like, "No, we've been here for a while." (Maggie, L)*

From this, Maggie reasoned that based on how long her family had been in the U.S. that her father might be exaggerating the extent of their Irish ancestry:

They are all supposedly completely Irish, but being in the US for so long, it wouldn't make sense for [my father's ancestors] to all be completely Irish. (Maggie, L)

In addition to her doubts about the imagined timeline, Maggie's own lived experience made her suspicious:

Well one, I could tell that I wasn't your standard pale, red-headed Irish person. In the summer, especially younger, I would get very, very tan. …And I'd be like, "Okay, this doesn't seem like your standard Irish thing." (Maggie, L)

Motivated by these series of doubts regarding her father's story about her family's Irish origins, Maggie decided to investigate her family heritage on her own. Maggie's case was not unique—other participants recalled seeds of doubt that prompted them to question and further investigate their ancestors' stories of family origin, life-changing experiences, and purported accomplishments. But identifying even substantial changes was a challenge for each generation without some sort of challenge to the version they were handed down.

Deciphering inherited family stories is part of the continual, interpretive process that family members engage in to construct and pass on their family memory. Even when stories are readily told or made available, listeners can have difficulty understanding and interpreting them. Our participants devised alternatives to decipher meaning apart from asking the direct source. They interacted with someone more knowledgeable to rectify misunderstandings, translated illegible content into more modern forms, and drew on their own embodied and lived experience to make interpretive judgements.

Reconstructing the Stories

When deciding how to pass on the information they had recovered, participants then reconstructed their own versions of the stories to pass on. In this section, we draw out the values underlying the strategies that participants employed to tell and retell family stories. The teller's agenda, as well as the anticipated needs of future listeners, and clarified preferences and values shaped the stories they wanted to pass down to future generations. From our participants' experiences, we see that a story is not a simple, concrete entity, but a malleable conveyance crafted to deliver information for particular purposes, audiences, and circumstances.

Shaped according to agenda

Tellers shared their memories with a range of agendas. Some derived personal enjoyment from sharing about their lives and about people they had known, while others discussed sharing stories about their past as an educational effort. From these agendas arose storytelling goals, like the desire to *"leave a legacy,"* to *"indoctrinate"* younger generations of family values, to *"teach a lesson,"* or to make beloved ancestors *"come alive"* for descendants who would never know them in person.

Barb, for example, reflected on how she was sharing the family stories she had heard from her father with her own children. As she wrote down these stories, she recognized that her desire to *"guide"* her children was reflected in the way that she retold these stories.

I guess what would probably come across would be my own bias, the way I want that person to remember the story or remember the incident. (Barb, T)

The agendas that drove participants like Barb to pass on a family story also shaped the story itself, yet, as we saw in prior sections, such alterations were not always accepted by future generations.

Anticipating descendants' wishes

In addition to their own motivating goals, our participants discussed ways that they tried to be attentive to their listeners. Even in cases where people had no contact with their prospective listeners, they tried to anticipate the needs of their future descendants to direct decisions about the content and form of their mediated stories. Yet, as has also been noted in prior work, the inherent uncertainty in these predictive activities was a source of concern for tellers [24,34]. Older participants in particular felt a sense of urgency to pass on their stories, and wished turned to "*more formalized"* written or recorded media to share. But without an immediate and known listener, tellers described a sense of "inertia." Our participants had several ways of working through this uncertainty and its immobilizing effects.

One strategy, as Caleb described, was to do *"as much as I have interest in doing*." As motivation, he imagined that *"I have descendants like myself,"* and proceeded as though he would be the recipient of the stories he told. In this way, he chose to create an image of an ideal descendant and used this persona to help motivate and direct his efforts.

Joe, a grandfather who often consulted on family history research, offered another alternative; he decided to disregard his audience altogether and simply preserve those stories that he enjoyed telling. To him, regardless if his descendants were eventually uninterested, he would at least derive some value from the experience.

*Somebody asked me the other day, "Why should I do this if my kids don't care?" My answer was this: "They may not care now, they may care when you die, they may care when someone else passes, they may care when a child is born, or they may just wake up one day and go, 'Who the f*ck am I? And who the f*ck are you? And where did you come from?'" And I said to him, "Don't do it for them, do it for you." (Joe, T)*

By assuming their listeners were like them, or would be happy with whatever they wanted to pass on, Joe and Caleb could overcome the inertia and create something that might be of interest to future generations. This strategy was far from perfect. We point out that much of the effort we have outlined in the past sections is a direct result of future generations *not* receiving information about their past that they needed or wanted. However, passing on some partial account, rather than nothing, was more desirable for tellers and might provide useful starting point for listeners

Clarifying values and goals through working

The values and goals that tellers expressed as motivators for sharing memories were not always apparent to them at the outset. They were often clarified in the process of working through various ways to pass on these memories. Joe, for example, shared that he decided to make a photobook of a trip he had taken with his late wife because he felt it was important for his grandson to have some familiarity and impression of his wife. Creating the book was a "*poignant*" way for him to share her memory, *"'cause she's not here to tell her side of the story." (Joe, T)*

Through this process of creating the book for his grandson, Joe realized that he really cared more about sharing the *"stories behind those pictures and what they represent"* rather than the pictures themselves. The realization that he really valued the story shaped Joe's entire approach to sharing memories. He stopped keeping photos altogether, and focused on ways to preserve the stories associated with the things around him.

It hasn't been until I've been doing this work that I've come to realize [that] the stories that I value are worth preserving.… How many pictures do I have of [my grandkids] …? But unless it has some meaning, I'm not sure I really want to keep the picture now. But I want to capture the story that goes with it. (Joe, T)

Each person and family is different in what kind of memory artifacts they value. While Joe preferred text, other participants in our study described their families as *"photo people" (Maggie, L)* who kept only photographs to pass on rather than text. This scenario we present here is not proscriptive of a right or wrong way, but illustrates one way that working through a project can help people discover what they value and how they want to share their memories.

We share these examples of reconstructing stories to demonstrate how the values and social context of the storytellers with respect to their past and future family members could influence the form the story took as much as the content of the memory itself. These influences are perhaps made more apparent when tellers turn to more formal means of storytelling, such as written memoirs or memory books, to preserve and convey their memories. Adopting more formal methods, in contrast to ad hoc and in-person storytelling, required iteration and practice from tellers to clarify their goals and values and to find a format and structure that resonated with the story's purpose.

The reflective and clarifying nature of these activities can be helpful to storytellers, but they require a certain level of skill to accomplish well (e.g. [22, 34, 36]). The insights from these findings can serve as foundation for interaction designers to better support the value-driven, socially motivated, and reflective practices of reconstructing family stories to pass on to future generations.

Summary

In these findings, we highlighted some of the key intergenerational practices of passing on family stories, including proactively working to discover stories from different sources, deciphering stories to make sense of the content and meaning, and reconstructing stories according the goals and needs of current and future listeners. We have highlighted the co-constructive nature of these practices, carried out by both tellers and listeners in face-to-face scenarios and through mediated forms. We also seen how long timespans, personal agendas, and collective values entangle to create a complex set of sociotechnical challenges for memory sharing, especially in contexts where direct communication is not possible. In our discussion, we reflect on these insights to inform the design of everyday interactive systems for long-term, asynchronous, and asymmetric information sharing.

DISCUSSION

In our findings, we have drawn together the perspectives of tellers and listeners to build an understanding of family stories as products of the co-constructive and interpretive practices of family memory sharing. Based on insights from our findings, we propose three critical design features for information systems which support multi-generational interactions. Designs do not necessarily have to implement all of these features, rather each feature foregrounds important questions in the design of such multi-generational information systems.

First, systems for passing on and sharing family stories across multiple generations of users must navigate co-constructive interactions from multiple actors. Second, systems must facilitate communicative interactions with an unknown listener. Third, systems must preserve the

interpretive signals that aid in understanding shared information. In the following sections, we ground these features in our particular design space of family memory, and discuss the outstanding questions that arise for the design of multi-lifespan systems that are embedded into everyday life and social practices.

Navigating Co-Constructive Interactions

Many of the novel designs for memory sharing in HCI support the interaction model of an active teller and a passive listener. In this view of memory sharing, listeners are simple recipients of stories chosen and shaped by an independent teller. While implementations vary, from AR apps like Tales of Things [3] to bespoke "technology heirloom" devices [27], to digital legacy platforms like SafeBeyond.com, these designs center agency in the creator of the content, or the teller. In contrast, our findings show that participants trying to learn and build their family memory were active seekers and creative participants. When listening, they were active co-creators who "*pestered*" and questioned older family members to draw out and verify family stories, exerted great effort to decipher inherited content, and reconstructed the stories learned to pass down to their own descendants.

Supporting this multi-agent model of interaction in design presents opportunities for new work and new user models for designers of collaborative information systems. For example, there are a few examples of systems that support a more active conception of recipients of family stories by framing them as active seekers. For example, Bentley [6] designed a "treasure hunt" app for location-based memories in which tellers linked specific stories to a particular location. Listeners became active seekers in this model, and had to search for geo-cached keys to unlock family stories. In another example, Ancestry.com, a popular online genealogy research site, includes features that allow people researching their family history to seek out social support, ask questions, and find possible relatives. These systems envision listeners in a more proactive role as information gatherers. As we showed in our findings, these examples are just the beginning of the many interaction possibilities to support for family stories. These two user models focus on *finding* information, but stop short of enabling many of the re-constructive and interpretive practices of sharing family stories that we have outlined.

An example of a new interaction model from our findings is a conceptualization of family stories as a mosaic: the product of many small contributions from a variety of perspectives. To implement this model, a system might take a tangible design approach to allow several different tellers to save pieces of information, anecdotes, and stories that have inherited as individual tokens. Open sets of these tokens could be assembled and reassembled into a narrative by the originator or subsequent teller-listener agents, enabling the continuing development of the evolving story.

However, in supporting multiple, agential contributors, these systems must also be able to handle emergent inconsistency. As both listeners and tellers can be active participants, they also approach family memory with their own agendas, perspectives, and preferences. The resulting differences, compounded over time and multiple generations, can result in threads and counter-narratives that crystallize, warp, and diverge. In our findings, we saw several examples of how stories shifted drastically over time even as small details were omitted in retelling.

Some inconsistencies may not be problematic for family stories, while others may create rifts and tensions. Future work should examine the effect of divergent information in multi-generational interactions in different contexts and settings. Designers may address this open challenge by incorporating mechanisms to account for multiple social-temporal influences that can alter shared content.

Dialoguing with an Unknown Listeners

When deciding to preserve and share family stories with future generations—descendants that would live long after the teller was gone—tellers turned to various recording methods to preserve their stories. Yet, as we saw in our findings, the intergenerational setting often meant tellers did not know who their listeners were. This uncertainty could create "*inertia*," or a "teller's block" of sorts, when tellers are unable to sufficiently imagine the future audience with whom they wished to share. This difficulty stymies efforts to preserve and pass on important memories.

Little existing work in HCI seeks to directly address the challenge of unknown listeners in sharing family history. Those that do employ common in oral history strategy of providing substitute listeners—either human or automated interviewers. For example, the Palaver Tree online platform used classrooms of curious, questioning children to provide opportunities for older adults to share their family history [10]. The GrandChair augmented a comfortable armchair with a child-like, conversational agent to ask prompts to elderly people videorecording their own memoirs [33].

The breadth of interactions with human interviewers still exceed the interaction capabilities of more automated methods. However, the independence offered by more automated or individual methods is important to consider. Family stories are often private, with sensitive family details that tellers would not share openly or in the presence of an outsider. These considerations motivate the development of alternative ways to overcome "teller's block" and to facilitate independent storytelling.

One approach might be to provide tellers with premeditation support as part of suite of reflection tools. Activities like reflective journaling which are already used to help people remember the past (e.g. [29]), might be adapted for persona development to create imaginary descendants. They might to provide prospective scenarios as prompts to trigger more situational storytelling.

Another approach is to expand the possible uses of conversational agents. These kinds of automated systems can provide more privacy while mimicking the interactivity of in-person storytelling. But, while these systems are advancing quickly, they are currently limited in the extent to which they can effectively probe and facilitate deep introspection. Nevertheless, a well-designed listener replacement system could serve an important complementary role to other strategies. For example, designers might creatively leverage the current limitations, such as a constrained vocabulary, as a feature. The limited understanding of an AI could act as a reasonable proxy for the limited contextual knowledge of a future listener. An AI's failure points on colloquial terms or turns of phrase could help tellers identify elements of their stories that might need additional explanation. The system could also ask follow-up questions to draw out more detail to help future listeners better interpret the shared stories.

Regardless of the approach, to be effective in helping people to share their memories in an engaging and authentic manner, designs must prioritize the values and agenda a teller enacts when choosing to share a story with a particular audience. A combination of reflection, imagination, and interactive rehearsal could help tellers to clarify their purposes as well as generate content to share.

Preserving Signals and Significance over Time

The third feature we highlight is maintaining the interpretability of the preserved content over time. In our findings, much of the effort in learning about and passing on family stories was wrapped up in communicating or recovering the context of the memory being shared. The context was important to our interviewees to shape how they would interpret the story itself. Yet, maintaining the interpretive context of a family story is complicated by the distributed, multi-agential and asynchronous nature of how intergenerational memory is shared.

The myriad elements of social (audience), circumstantial (time/place), and immaterial (agenda) context that could be conveyed and represented along with the content of preserved information yield a fertile field of directions for future work. We propose that a particularly important element of context to prioritize for family memory is the intent, or agenda, of the family member. While we reserve judgment on how tellers or listeners should regard one another's preferences, we do believe that it is the responsibility of the designer to ensure that each users' intentions are followed as closely as possible.

Interactions with family memory artifacts, including information artifacts, are embedded with social values and carry social weight [14,19]. Systems which seek to mediate these interactions, especially beyond the lifetime of the initial user, must also be able to bear the social weight that this entails. For example, if a teller wants to use a storytelling system to record a family story as a liberating confessional but *intends* that it never be disclosed, there should be some indication about how likely the system capabilities can perform with respect to this intended use. Further, recorded artifacts themselves might somehow convey descriptive metadata that communicates the intent of the creator to future recipients. This might range from overt labeled instructions ("Do Not Give to Steve"), to subtle emotive information, like using color to signal whether a story is sad or happy. Regardless of the style of communication, designers must consider ways to preserve the context which enables the long-term interpretability of shared information, including the intent.

Summary

In this discussion, we have drawn out three key features for multi-lifespan systems that support the asynchronous, asymmetric information sharing characteristic of family memory. These systems must account for multiple agents contributing information with their own agendas and interpretations, facilitate one-way communications with an unknown future listener, and provide features to preserve the interpretive signals normally available from the circumstantial and social context of the shared story.

We did not address cultural differences between families of in our analysis or discussion. We did not find that these influenced practices at the level at which we discussed them. Nonetheless, culture plays an important role in shaping family memory practices. We look forward to future work that builds on this work and illustrates the diversity of cultural and family-specific practices.

While we have focused on the practices of sharing family stories, the design challenges and opportunities of this setting generalize more broadly to contexts where sensitive and value-laden information is shared through multi-lifespan information systems. In particular, we highlight the ways in which personal and collective values regarding information content and handling can shape its eventual destiny.

CONCLUSION

In this paper, we contributed a detailed account of the intergenerational practices involved in passing on family memory across generations through family stories. These practices are critical components of families' processes of coming to a shared understanding of the past. We described how family stories are collectively co-constructed by family members in fluid roles of storytellers and active listeners working to discover, decipher and reconstruct family stories. We also identify strategies and challenges that family members face when conveying life experiences, life lessons, and historical information through family stories. In our discussion, we proposed opportunities for the design of multi-lifespan information systems to account for multiple contributors, to facilitate sharing with unknown listeners, and to preserve interpretive context over time. These findings and analysis provide an important foundation for understanding and developing for human values in socio-temporal settings.

ACKNOWLEDGMENTS

We gratefully acknowledge the contributions of our participants, the Social Worlds Research Group, DoIIIT Studio, and the anonymous reviewers. This work was supported by a NSF GRF (DGE 1256260).

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