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Life-Long Collections: Motivations and the Implications for Lifelogging with Mobile Devices

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ABSTRACT

In this paper the authors investigate the motivations for life-long collections and how these motivations can inform the design of future lifelog systems. Lifelogging is the practice of automatically capturing data from daily life experiences with mobile devices, such as smartphones and wearable cameras. Lifelog archives can benefit both older and younger people; therefore lifelog systems should be designed for people of all ages. The authors believe that people would be more likely to adopt lifelog practices that support their current motivations for collecting items. To identify these motivations, ten older and ten younger participants were interviewed. It was found that motivations for and against life-long collections evolve as people age and enter different stages, and that family is at the core of life-long collections. These findings will be used to guide the design of an intergenerational lifelog browser.

Keywords: Automated Wearable Cameras, Family, Lifelogging, Life-Long Collections, Mobile Devices

INTRODUCTION

In this work we are concerned with people's motivations for life-long collections and the implications for lifelogging with mobile devices. Lifelogging is the digital capture of life experiences typically through mobile sensors or devices. Lifelogging is a relatively new concept with early pioneers such as Steve Mann concentrating on making wearable devices

smaller and smaller (Mann, 2012). Lifelogging devices, such as wearable cameras (Figure 1), have been shown to support reflection and story-telling within family groups (Byrne & Jones, 2009; Lyndley et al., 2009) and lifelog collections, such as emails, photographs, and context data (e.g. GPS) also have the potential to support reminiscence (Kikhia, Hallberg, Bengtsson, Sävenstedt, & Synnes, 2010). Digitally archiving into old age would mean

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that we could review a lifetime of events, from everyday routine activities to significant occasions. Recording and reviewing one's life can be therapeutic for an individual, and allows an older person to leave a legacy for their family to remember them by, and to remember the generations before them. It is now possible to record thousands of photographs per day, videos, dietary logs, emails, music preferences and so on. Until recently the SenseCam (see Figure 1 for examples of wearable devices) has been the only viable option as an automated wearable camera, being small, compact and more or less unobtrusive. The device is a lightweight camera, worn around the neck, capturing up to three thousand images per day without any user intervention. However recent developments have seen the release of the Autographer (www.autographer.com) and Memoto (<http://memoto.com/>), which include integrated GPS and longer

battery life. A short leap from these devices are wearable computers, which record information from the environment and display it back to the wearer in real time, such as augmented reality glasses, Google Glass (www.google.com/glass).

It has been proposed that ubiquitous smartphones can provide a more accessible alternative to automated wearable cameras such as the SenseCam (Gurrin et al., 2013). Although smart phones are primarily designed for hand-held interaction, with the gradual reduction in size and weight, it is believed that the "wearability" will increase. According to Gurrin et al., smartphones hold several advantages over automated wearable cameras. For example, they encompass a range of on-board sensors (such as accelerometer, compass, camera, GPS, WiFi and Bluetooth etc.), they are more ubiquitous, cost effective and familiar for users, they can support real-time analysis of sampled

Figure 1. Examples of mobile devices for lifelogging. Top: Smartphone (left), and Memoto wearable camera (right). Bottom: SenseCam (left) and Autographer (right) wearable cameras.



life-experiences, and they have the ability to act as both the data-gathering device and the data-display and feedback device. According to a PEW Research Centre report, 66% of people aged 18-29, and 59% aged 30-49 years own a smartphone, however older adults are slower to adopt the technology with only 34% aged 50-64, and 13% of 65 years and older owning a smartphone (Smith, 2012). In a previous study on older and younger people's everyday use of technology, we found that although older adults' use of mobile phones was limited to basic functions, such as making calls and sending text messages, supporting the findings of previous studies (Kurniawan, 2008), the camera function was also commonly used by older adults aged 50-64 years, with 70% using this function. This suggests that there is potential for the adoption of mobile phones as visual lifelogging devices by both younger and older people.

One of the challenges of using a smartphone as a lifestyle capture device is preserving battery power. However, several efforts are underway to increase the battery life of these mobile devices to support lifelogging, allowing automatic capture of events throughout a whole day (De Jager et al., 2011; Qiu, Gurrin, Doherty, & Smeaton, 2012). We are moving ever closer to the day when lifelogging will be automatic and unobtrusive, recorded by discrete wearable or mobile sensors without manual intervention, and wirelessly transferred to a digital storage facility in the cloud.

With the introduction of smart phones and automated wearable cameras, researchers have begun to explore how large scale image sets could support people with memory impairments, including older adults with dementia. Past research has shown, however, that older adults are significantly more likely to accept new technologies when the older person is of high-cognitive functioning (Mayhorn, Stronge, McLaughlin, & Rogers, 2008). The willingness of older adults to adopt technology is also dependent on numerous factors, including relevance to their lifestyle and interest. Based on this research, we believe that to successfully introduce lifelogging technologies, we

need to consider the needs and preferences of high-cognitive functioning older adults, and how lifelogging would fit into their lifestyle and interests. This information can then be used to inform the design of a lifelog application to support these needs and preferences.

Lifelog Applications

A broad range of lifelog applications have emerged from this growing body of research. For example, Kelly et al. (2011) used passive capture wearable cameras to investigate active and sedentary travel behavior, and Doherty et al. (2011) used lifelog images to automatically detect daily lifestyle traits of a person. Lifelog collections can also be used as digital biographies, incorporating email archives (Hangal, Lam, & Heer, 2011), or for creating stories from multimodal content, such as photos, email, and documents (Byrne & Jones, 2009). The DietSense project in UCLA makes use of a mobile phone, hung via a lanyard around the neck, to capture pictures of meals automatically for documentation and dietary analysis (Reddy et al., 2007). Another area of interest is market research, where mobile devices are used to observe what products and stimuli potential customers are exposed to, with a view to relating this to the effectiveness of a marketing campaign (Hughes et al., 2012).

Due to the vast quantity of data that can be recorded by mobile lifelogging devices, managing collections in a way that users can quickly and easily retrieve events is challenging. Several approaches have been developed to organise this data. For example, the software in the MyLifeBits project (Gemmell, Bell, & Lueder, 2006) uses a database to support the management of its numerous data sets through hyperlinks, annotations, reports, saved queries, pivoting, clustering, and search. Doherty and Smeaton (2008) utilised sensor readings embedded in the SenseCam to automatically segment large streams of lifelog data into meaningful events, where an event constitutes an activity such as having lunch, talking to a neighbour or watching television etc. Kalnikaite, Sellen,

Whittaker, and Kirk (2010) maintain that both image and locational data is needed to provide context when reviewing lifelogs.

Whittaker et al. (2012) point out that people are often reluctant to delete information, and therefore for large digital collections, access to data should be simplified by making important items more prominent. This is a relevant statement, as data can accumulate rapidly and efficient browsing, searching and retrieval techniques are needed. These developments are already underway (Doherty et al., 2012). Whittaker also maintains that digital mementos need to be integrated into the everyday lives of people so that they are not overlooked and “invisible” compared to physical mementos. We believe that mobile devices with screen display are necessary for lifelogging so that users can interact with their collection in real-time to avoid becoming lost and forgotten in a huge lifelog archive. Alternatively, wearable cameras could automatically and wirelessly transfer images to a person’s smartphone. In a study examining people’s usage behaviour for capturing and sharing on mobile phones, Olsson et al. (2008) found face-to-face sharing of digital memories to be significant in supporting reminiscence and story-telling. Providing the ability for users to easily, view, search and share their lifelog images could have a significant impact on their motivation to lifelog.

Collections in the Home

Creating and gathering artefacts over our lifetime is a typical human trait and family homes are central for storing these collections. Petrelli and colleagues classified mementos found in the home into three groups; public, family and personal (Petrelli, Whittaker, & Brockmeier, 2008). Public mementos are those that are displayed in public rooms where visitors are welcomed and are usually displayed due to aesthetic quality. Family mementos on the other hand are displayed in rooms where the family spends time together and represent the relationship between family members (e.g. children’s artwork). Finally, personal mementos are items that are meaningful to the self or to long past

events, such as trophies for sports achievements. As Petrelli et al. points out, mementos, particularly digital mementos, can be hidden in folders or boxes and are not initially valued as highly as those on display. Often childhood mementos are boxed and put into the attic so that they can be rediscovered at a later stage either by the person who collected them or their family. Other ‘hidden’ items might include old calendars and diaries, scrapbooks, receipts and medical certificates that build a rich narrative of a person’s life and lifestyle. It is interesting to consider these everyday mundane items that people choose to collect and keep. Although these items may not be on display in the home, they hold significance either to the past or to the future.

Sellen (2011) identified six different values that people place on home archives including: defining the self; honouring those we care about; connecting with the past; framing the family; fulfilling a duty; and purposeful forgetting (i.e. archiving items that may have significance but are painful at the time of archiving). Odom, Pierce, Stolterman, and Blevis (2009) also explored the attachment that people place on possessions, placing emphasis on the role of the object itself. They found that the reasons why people hold onto objects are related to (1) the extent to which the owner engages with the object, (2) the extent to which they preserve personal histories and memories, (3) the extent to which an object has been reused, renewed or modified, symbolising the owner’s resourcefulness, and (4) the perceived durability of the object. Petrelli (2013) proposes that there are three elements contributing to the concept of personal heritage: values to select what is worth preserving; attention, to keep it alive and meaningful for those who come after us; and time, which gives us perspective. Kroger and Adair (2008) interviewed a sample of older adults about their valued personal objects and found that their cherished possessions were important for identity maintenance, creating a link to cherished relationships, family across generations, and past events among others. Similar results were previously found by Cram and Paton (1993) when exploring the relationship

between personal possessions and self-identity for elderly women.

These studies focus on the possessions and artefacts that people currently possess, but they do not explore what types of objects that people had collected in the past or the types of objects that they do not have but would like, for example, artefacts that did not seem important at the time but later on gained significance. These ideas deserve careful consideration to inform the design of lifelog/archive systems.

Understanding the motivations for why people collect or throw away their collections may further inform us of the changing value placed on items. To better understand the motivations behind life-long collections several factors need to be considered. For example:

- What are the reasons for or against collecting items over a lifetime?
- What are the triggers for reviewing these collections?
- Understanding this, how could future lifelog applications be designed to accommodate older and younger family members?

In the remainder of the paper we will discuss the research methods used in this study, outline the findings from the interviews and finally reflect on how these findings can be used to guide the design of a lifelog system.

METHOD

The Study

To explore people's motivations for collecting or keeping items throughout their lives we conducted semi-structured interviews with a total of twenty participants (see Table 1). This included ten older adults (4 male and 6 female; age 51-75) and ten younger adults (4 male and 6 female; age 20-35). The participants were asked questions about themselves, their motivations and their practices.

The interviews were carried out individually in the participants' home. This was to ensure that the participants were comfortable throughout the interview and also to allow the home environment to act as a memory support to help answer questions regarding their collections. The interviews normally lasted 45 minutes and were audio recorded. The participants were asked a specific set of questions, however, if a participant mentioned a new topic then this subject was further explored. Examples of the types of questions that the participants were asked included: *Is there anything that you keep or collect either now or in the past? What are your reasons for keeping these items? Where do you keep them? Do you ever take these items out to look at, and if so why?*

Table 1. Participant demographics including gender, age, mobile phone, computer and Internet use, and computer experience

	Younger	Older
Gender	Female (n = 6), Male (n = 4)	Female (n = 6), Male (n = 4)
Age (average)	29 years	62 years
Mobile Phone	Yes (n = 10)	Yes (n = 10)
Computer	Yes (n = 10)	Yes (n = 9), No (n = 1)
Internet	Yes (n = 10)	Yes (n = 9), No (n = 1)
Computer Experience (average on Likert scale 1-5)	4 (very familiar)	3 (familiar enough)
n = number of participants; Likert scale 1-5 where 1 = Never used Computer and 5 = Expert Computer User		

Data Analysis

Audio recordings of the interviews were transcribed and analysed. We used the qualitative research approach of inductive thematic analysis to examine this data. Thematic analyses focuses on identifying and describing both implicit and explicit themes within the data. A large number of codes were generated from the interview data.

Initial coding was carried out separately by two researchers. The relevance of these codes was then discussed and agreement on the final coding structure was met. These codes were then compared for frequency, and co-occurrence. We identified several themes, each containing subthemes to help understand motivations for life-long collections. These themes are presented in Table 2. Our results are presented in three parts: the motivations for collecting items; motivations against life-long collections; and finally the triggers for revisiting collections.

Interview Findings

The results presented in this paper highlight the reasons why people collect items throughout their lives, and also the relationship they have with these items. The level of attachment that people place on items is interesting in the context of lifelogging. For example, some collections represent a time in a person's life (childhood, university etc.) and are important because of this association. Collections can also be associated with a single experience, such as a first date. Other collections are functional, reminding people or stored just in case it is needed. These findings have significant value towards

informing why visual lifelogs might be stored. Another aspect is how people manage their collections. The findings outlined in the following sections show how people deal with space limitations, both physical and digital, filtering, deleting and discarding information that does not have significant value to them. In terms of lifelogging, the management and display of images is complex due to the large quantity that can be recorded by a wearable device. The results below go some way towards understanding how this can be achieved.

Motivations for Collecting

Overview

The focus of this study was to understand what motivated people to collect particular items throughout their lives. We were interested in why the participants collected artefacts, what they did with them and what they intend to do with them in the future.

Analysis of the responses resulted in us identifying five main groups of motivations: memory support, sharing, precaution, sentiment and family background. We now discuss these in more detail.

Memory Support

Memory was a key motivation for life-long collections for all of the participants. This was not surprising as research has shown that mementos such as photographs are successful aids for both retrospective and prospective memory. The participants described the way in which their collections supported memory through

Table 2. Themes identified throughout the interview study

Motivations for collecting	Motivations against collecting	Triggers for reviewing
Memory Support	Loss and Deletion	Discovery
Sharing	Effort	Third Party
Precaution	Identity	Intention
Sentiment		Death
Family Background		

referencing, reminding, reminiscing and reflection. Referencing was used by participants to find and verify information from the past. Some of this information was for practical purposes. For example in one case a participant wrote down the days he took as holiday leave from his job and another participant collected her household bills so that she could compare them from one year to the next. Participants also commented more generally on how experiences can be forgotten without having a record to refer back to:

Such a large portion of your life is gone and otherwise it might as well not have happened. (Male, age 35)

Collections such as souvenirs and photographs acted as reminders for past events whereas appointment diaries and calendars for example, reminded participants of future events. People who shared the same experiences could also support each other's memory by talking about the event.

Reminiscing is a purposeful form of remembering experiences in the past and can be personal or shared. From the current interviews it was found that shared reminiscence was most common between family members to compare their experiences, compared with other social groups such as friends or colleagues. For example one of the participants said:

I would reminisce with my sisters and especially my brother. I suppose because his impressions would be different because he was the only boy and they would be different. (Female, age 68)

Artefacts such as photographs support reminiscence by triggering a memory and stimulating conversation. The artefact itself may not have a direct relationship with the past but it is what the artefact represents to the owner that is meaningful. For example, one of the participants told us of a painting he bought of a canal because it reminded him of his childhood. He remembered his mother warning him to stay away from the canal but it was the first place

he went every day after school (see Figure 2). Similarly, collections can support reflection on one's life, experiences and identity by allowing the owner to reflect on how they have changed in their appearance, their thoughts and the people that have come and gone throughout their lives. For example, one of the older participants said:

Sometimes it's nice....it helps you remember how you felt at that time and how you were, and like you know, maybe as well how young you were. I suppose you see all the stages of your life through the things you keep. (Female, age 61)

Sharing

Collecting items to share with other people was also a motivation for participants. Inheritance, or passing items down through a family, was one form of sharing. Some of the participants had inherited items from family members that had passed away. These artefacts were meaningful to them because of the relationship with the previous owners. Other participants collected items with the intention of passing them on to their children in the future:

I started to collect things more so since I had my family. I would be much better at keeping things, you know, for them down the road. (Female, age 61)

The act of passing important and meaningful artefacts to another person highlights the closeness of the relationship, the trust and responsibility of taking care of something that was cherished by another person. Sharing items included face-to-face sharing, with either a physical object or an item on a digital device such as a mobile phone, camera or tablet computer. Items or experiences could also be remotely shared, such as sending a photo or video message on a mobile phone.

The relationships that people had with others determined the types of items they shared. Family sharing was the most common and significant for all of the participants. Items such as photographs and videos that illustrated

Figure 2. Photograph taken in participant's home of a painting. The painting was bought because it evokes memories of his childhood.



experiences, events or young children were most frequently shared within family groups. Groups that people shared their collections or lifelogs (travel blogs, Twitter feeds etc.) with also included friends, work colleagues, online social network friends and public Internet users. Items that were shared with friends were personal and most often related to a shared interest or experience. Items shared with work colleagues, social networks and public were less personal, but also related to shared interests and experiences.

Third party involvement was a topic that many participants brought up. This was in relation to other people capturing a record of events that involved the participant or an item that the participant had that was a record of a third party. For example, one of the older participants told about a family gathering she had recently attended where they met with family they had not seen since childhood who had photographs from this time that the participant did not know about:

We had a family gathering a few weeks ago and it was brilliant...that people brought things that you wouldn't have seen. (Female, age 56)

Privacy was also a common theme when the participants were asked about sharing, particularly for collections which contained past opinions and thoughts such as a diary. None of the younger participants who had written a diary wanted future generations to read it. The participants said that when they wrote their diary they had never intended other people to read it and would still never want anyone to read it in the future. Although the participants' own diaries were private, both older and younger participants showed an interest in reading their parents' diaries. For example, one participant said:

I just think if it was me, if I found my Mam's diary I would like to go through...like not to read her personal in-depth life stories but you know

it would be nice to have a record of what she did this day or that. (Female, age 28)

Appointment diaries were considered to be less private however and were often shared with friends and family. This was mainly for ease of organising events and activities between people. These shared appointments were recorded either using wall calendars or appointment notebooks made available in the home, or through shared online calendars.

Precaution

Documentation was another form of collection that emerged with both groups. Apart from the youngest participant (aged 20), all of the participants kept official documents. The length of time that the documents were kept depended on their importance or the likelihood that they would be needed as a reference in the future. For example, for one of the younger participants it was a medical condition that motivated him to collect his hospital records:

I keep all my medical information because I got epilepsy a year or so ago. So everything from the epilepsy is all in a folder and filed away. (Male, age 25)

The primary purpose of collecting documentation is to act as a record for an official process, such as getting a mortgage, a legal claim, or purchasing merchandise in a shop. It was found from talking to the participants that in some situations the significance of the documents change over time from being a simple record to becoming a significant memento. For example, in the current study some of the participants saved receipt items that were related to happy events, such as the bill for a wedding, or a receipt from a sky dive. One of the most common reasons given for keeping these items was as a precaution, in case it was needed in the future. This was more often for official items such as medical, legal or financial documents, but personal collections were also kept should anyone ask for them in the future. One of the

participants explained that she was advised to hold on to her legal documentation after she was separated from her husband in case she ever needed to return to it:

I would have kept a lot of things from the time I was separated. Somebody once said to me to just keep them, you know, sort of in case you ever need them. (Female, age 61)

Sentiment

Written mementos were classified to include any form of message that has personal meaning to the participants, either physical or digital. Physical mementos included those that were sent from another person such as letters or postcards. These often had sentimental attachments if they were from loved ones, particular those that were now deceased. Many of the participants, both younger and older mentioned letters, cards or postcards that they have saved because the person who gave them was important to them and had passed away since. The handwriting of the sender was a particularly important component of these messages.

Other written mementos included diaries, either personal diaries where the participant expressed their feelings, or diaries where the person wrote down activities they engaged in and the places they went. Digital messages were also considered to be meaningful to participants. This included emails or text messages that were sent to the participant particularly if the subject matter related to a happy event or if the message was from a person who rarely sent them. For the participants who had sent letters or emails home when they were abroad for a long period of time, they found on their return that when the messages were combined they created a log of their experiences that they wanted to keep for themselves. Although the intention of the letters were to communicate with their family at home and keep them updated on activities, after time the meaning of the letters altered, motivating the participants to reclaim them as records of their own experiences. Lifelogging, in the same way could support communication and sharing

of experiences between family members for short-term use, while at the same time acting as a record of events which people can return to at a later stage in their life.

People were motivated to collect and keep items because of the meaning attached to them. Collections were deemed significant because they represented memories for the owner where other people would not see value:

They're your treasure, they're yours. They're everything to you. (Female, age 51)

Attachment to items was often strengthened with time or because of the event or person to which they relate. One of the participants told that he kept his wedding bill and over time the attachment to this item became stronger because of the event that it represented:

We've still got the bill we got for our wedding. It's just something we have...we never really thought about throwing away. The longer you keep it the more you sort of become attached to it. (Male, age 64)

Relationships were represented through collections such as scrapbooks or items given as gifts between people. They also represented the individual's identity, the person they were in the past and the person they are now. Collections were used, particularly by participants that were parents, as a catalyst or aid to tell their children about their younger selves:

I'd like them to see me not as their mother but as a person who was young like they are and was going through all the things they went through. (Female, age 61)

Family Background

Throughout the interviews we asked participants to talk about any collections they had that related to their family history. Photographs were frequently mentioned by all the participants as recorded items and verbal family stories for

non-recorded information. Verbal story-telling was the most common method and included participants telling stories to younger generations or participants telling friends stories about their family:

I'd talk about any stories I have for them [children] and when I was a child. Always, and always did. You know they loved to hear what you did when you were small. What you played when you were small. What trouble you got into. (Female, age 56)

In some cases family stories were recorded through diaries, as part of writing courses or to intentionally pass onto children or grandchildren.

Each of the family groups had access to a family tree that was either created by them or by another family member. The level of information varied greatly between participants with some only having names and dates and others including photographs, birth/death certificates, newspaper clippings etc. The type of medium also varied between paper and digital versions. The older participants had more interest in their family tree compared to the younger group. This may be because they feel a responsibility to their children to pass on this information, an interest in the family history for themselves or as a way to record the life of loved ones that have passed. For example, one of the younger participants talked about his observations of his parents' experiences with the death of family members:

I see that with my parents with my grandparents passing...I've been to three funerals now over the last four or five years of parents of my parents...and you see that they become very very conscious of...being aware of...publicising and evaluating the legacy that those people left behind. (Male, age 29)

Motivations for developing the tree varied whereby some participants continued on from a tree that was already created and others started

one, acting on an interest they had in their family background. One participant's interest was sparked when she began an online family tree as part of a computer class. There was also a strong motivation to pass on this information to children and to preserve the family history, as one participant said:

I think it's important to collect these things and whatever way they're collected, to share with other people. (Male, age 54)

An issue that concerned the participants about their family tree or family background was the accuracy of the information. Access to family backgrounds were obtained from older generations, published material, public records such as census data, or online information. Problems that people experienced were not having older family members to ask to obtain this information, not trusting the person to tell the family history accurately or not trusting online resources because the content appeared outlandish:

I mean I have looked up my father's side and that was quite interesting. There again I got some of the stuff and I just thought it can't be right. (Male, age 64)

There were various factors that influenced the level of contribution by the participants towards gathering a family tree and background information. One of these was the access to information, where the participant did not feel competent to carry out the research by themselves. One of the older participants said how she did not use the Internet so she felt she could not look up information without help from others. Another reason that participants gave was because another family member had or is currently working on a family tree:

I would eventually be interested in working on a family tree but now that I have Dad working on it I don't see the need to duplicate any effort. (Male, age 29)

From the interviews it was found that often one person in a family conducted the background research and other family members contributed to this effort with any information they had available, for example passing old photographs or other items to a sibling who acts as the 'gatekeeper' of the family archive.

Public material concerning family background was a source of interest and pride for the participants. Documents that were published on paper or online were important additions to family collections. This included newspaper clippings, dedications to a family member in another person's book, and even a recording of a play telling the story of the participant's childhood. It was noted that when the participants talked about these types of items they talked about experiencing or reviewing them collectively with family;

My father wrote a book or started to write a book, and I think that was mainly about his war time. The thing was he did do a diary on that which we were only looking at the other day. (Male, age 64)

The above themes show how varied motivations can be for both older and younger people to collect items throughout their lifetime. Often the motivation for keeping a collection is different from the reasons why they were initially collected. Next we look at the emergent themes from the interviews that related to deleting or discarding collections.

Motivations Against Collecting

Overview

The reasons why people don't keep or collect life-long items were also of interest to this study. This section explores why collections are discarded or lost and also why they are not collected in the first place. The aim was to understand how the collection and deletion of digital items can be supported.

Loss and Deletion

The reasons for the loss or deletion of collections varied greatly and ranged from purposeful disposal to unavoidable loss. Death was a reoccurring theme for the older participants where information about the family was lost after the older generation passed away. The problem that people experienced was that once the older family members were gone, they had no one to ask for information:

We can't ask questions now because there's nobody to ask. (Female, age 64)

As people become interested in life review and family history when they grow older, it is almost inevitable that the previous generation will be elderly or deceased. Unless this information is documented in some way it would most likely be lost. The loss of family mementos was also an occurrence following the death of a family member where items were dispersed among surviving relatives and could no longer be traced.

The loss of collections was also put down to damage or theft of items. Some items such as photographs faded naturally with time. However, participants also talked about unfortunate incidents that happened in their home that caused their collections to become damaged. For example, one participant said that all her letters from her husband were singed when their house went on fire. Another participant told of her jewellery that was stolen. Not all damage to collections was accidental however. One of the older participants expressed her regret over the damage inflicted on family photographs when she was a child:

I love photographs. I have some old ones from when I was younger but there were eleven of us. But being kids we tore some of them and everything....I'd love to have them now. (Female, age 64)

Most of the participants deleted or threw out collections because they took up too much

space, both physical and digital. This was most common with official documents where there was no emotional attachment:

I'd pay the bills and then that's the end of them. (Female, age 75)

The participants spoke about their emotional responses to the loss of collections. Regret was a strong theme when it came to missed opportunities for recording life-long collections, particularly following the death of older family members:

You sort of regret after they go that I should have asked them this or I should have asked them that. Because my aunty who died it must have been about 18 months ago, she said to me "invite me round one night to yours and I'll go through all the family history with you". Because she was one of those who if you picked up the phone to her you knew you were there for an hour. You wouldn't get off. So we never invited her round. You know, and we should have done. (Male, age 64)

However, one person spoke of the negative attachment that can result from holding onto items connected to deceased loved ones:

A friend of mine died and I kept a text message on my phone from her. But then my phone was robbed. It was the best thing that happened because I wouldn't have ever been able to delete it. When the phone was gone I kind of got closure on it as well. It's very hard to delete everything. (Female, age 51)

In this circumstance the participant experienced a feeling of relief when the control and responsibility over the meaningful text message was taken away from her. This feeling of responsibility and attachment was common when collections had links to relationships with others:

I don't want to disregard them by throwing them away. (Male, age 57)

Effort

Motivations for and against life-long collections was determined by who in a household took control over the collections. It was found that one partner often took control over particular collections for the household:

I really don't [keep documents] because my wife does. But if she wasn't there I would keep them. (Male, age 65)

For both the younger and older parents in the sample it was the mothers who took control over collecting the children's mementos. In many cases the participants also had no control over the disposal of collections:

I would throw out half of the stuff in our attic. But I'm not allowed. (Male, age 54)

Although some types of items were not currently being collected a reoccurring theme of intention to record in the future was found. The participants claimed that they would like to or feel they should make a record of instances in their lives. The reasons given for why they do not currently record these items included not having the time, not being experienced with computers, and forgetting. The development of technology has meant that older versions of recording and viewing equipment are no longer used, making old recordings redundant. For example, home movies that were once recorded using a super 8 camera would have once been transferred to a VHS cassette, and then VHS to DVD and now many home movies are in file format. Transferring to modern equivalents can take up time and money:

I plan to organise the photos and I went as far as buying a scanner to do so until I realised this takes an awful long time. (Male, age 57)

Identity

For some participants the avoidance of making a record of life events was influenced by their

self-identity at a particular time in their lives. For example, some participants did not take photographs because they didn't want to see any images of themselves:

I had a pretty poor self image growing up. I never had an interest in seeing myself young. (Male, age 29)

One participant spoke of a significant event that happened in her life that prevented her from taking photographs. Again it may be that the participant simply did not want to remember or reflect on this time in her life:

I did take photographs to a point until my father died and I stopped taking them for a while. I don't know whether it was just where I was in my life, I can't explain. I didn't even want to be in photographs. And then I went back again and started again. (Female, age 51)

The motivations against life-long collections were dependent on numerous variables within a person's life, such as the amount of space they had in their home, the people they lived with or unexpected events that affected their collection, such as theft or house fire. In the next section we return to the collections that were saved by the participants and examine the types of triggers that prompt people to review their collections.

Triggers for Reviewing

Overview

This section will outline the reasons participants gave for reviewing their collections. From the interviews four main triggers emerged: discovery, third party, intention and death.

Discovery

The most common trigger that the participants gave for reviewing their collections was that they "came across" it. In most cases this was accidental, where the person was looking for something else and then became distracted by

these life-long collections. Often these collections would be stored away in locations such as the attic or wardrobe where they would not be easily found:

If I came across a box or something in the attic I would look through it and I would be amazed again at the bits of things that would be in it. (Female, age 68)

Environmental triggers, such as something on the television, also encouraged people to review their collections or stimulated conversations between people about events in the past. For example, one of the older participants said that the simplest things, like a cookery program could remind her of her mother's cooking and would prompt her to tell her daughter about the meals she had as a child.

Third Party

Another reason given for why collections are taken out from storage is when third party persons are interested in reviewing them. In the example below, it is the participant's son who requests her to look through her collections:

I have all the kids collections put away in case any of them want it, any of them for any reason. Like Donal last week said to me, 'Do you have photographs of us in the tennis club when we were small'? I said I have a few. So he wants me to dig them out. (Female, age 75)

In this situation the participant would have to review her collection of photos in order to find the relevant ones for her son.

Intention

With the previous two triggers, *discovery* and *third party*, the participants did not deliberately think to review their collections. However, the interview findings suggested that some triggers are intentional and can be motivated by boredom, for example. One of the participants said how they take out video recordings of their

grandchildren if there is nothing on television. Others told how they spontaneously review accessible items, such as photographs on their mobile phone when they are bored or waiting for something.

Intention to review collections was also triggered by the desire to remember events and to reminisce with other people. However, collections could be reviewed intentionally to support any factor of memory, such as remembering the name of a person or the location of a good hotel. Many of the participants particularly liked to review photographs to compare how they and other people looked at different stages throughout their lives. For example, one of the younger participants, a mother of two children, said she frequently looks through her photographs to see how her children have changed:

I love looking at the kids at the different stages. (Female, age 35)

Death

The final trigger for reviewing life-long collections that participants experience is death. The participants who had experienced the death of a loved one told us how the practice of organising the deceased person's legacy, and discovering their collections, inevitably resulted in reviewing these items and reminiscing over past experiences, either alone or with others:

We would have around the time when Mam and Dad died, got out the albums and looked through them. And again like that, the next thing you're sitting down for hours looking through them (female, age 61).

Webster and McCall (1999) showed that intimacy maintenance (e.g. keeping alive memories of deceased persons) is an important part of family reminiscence. He also maintains that older adults are more likely than younger adults to reminisce due to the proximity of impending death. This may not be limited to the individuals own death but could also be

triggered by the impending death of family members. For example, one of the participants spoke of how he reminisces over his life with his aged mother:

I like looking at photographs of when my mother was small and her wedding photographs and the people who were around then. Because we're not too far away unfortunately from the time when she won't be around. (Male, age 54)

DISCUSSION

Changing Motivations over Time

The changing values and motivations that our interview participants attached to their life-long collections could be attributed to the changes in their lives as they age and develop. We discuss these differences through three stages of adulthood (Erikson, 1976): young adulthood, maturity and old age.

Young adulthood is associated with forming relationships with other people through friendships or romantic partnership. Eric Erikson believed that these relationships test the firmness of our identity (1976). The motivations for collecting in young adulthood had strong relations to identity. This was true for the younger adults and the older adults talking about this time of their life. The participants collected items that related to them and their experiences. For example, all of the participants said that they took photographs at this time. Although the participants said that they shared these photographs with others, the primary reason for taking them was to have the collection for their own purposes. In other words, the collections acted as a record of what they did, who they were friends with and how they looked. Other collections that the participants were motivated to collect in young adulthood were items such as letters from friends or partners, scrapbooks (again related to friends or partners), and artefacts relating to or inherited from grandparents for example. As one of the participants said, these items remind you of who you were at this time and that people liked you.

As well as forming relationships at this stage, the participants were beginning their careers, opening up bank accounts, buying a car or house and getting married. With these life events come large quantities of documentation. In young adulthood, the participants' motivation for keeping these items was mainly as a precaution should they be needed in the future.

One of the most prominent motivations for parents at the **maturity stage**, or middle adulthood, was keeping a record of their children and keeping artefacts for their children to have when they are older (see Figure 3 for example). In contrast to young adulthood, the participants at this stage were not primarily collecting items for themselves. For example, although the participants said that they captured photographs and loved to look through them, they wanted these collections for their children to have and to see their childhood. Cards were kept from grandparents that parents thought would have significance to their children in later years. Similarly, the participants said that photos they had taken, when travelling for example, were initially captured for themselves but now they keep them so that their children can see the person they were and the things they did.

At maturity, the reasons against collecting images increased. For example, the participants would have moved out of their family home, taking their childhood collections and gathering new collections. One of the problems that the participants faced was having enough space to store these collections. This was true also with digital collections, as the participants did not only have to consider their own collections but also those of their family. The time and effort to collect artefacts was also an issue, particularly for those who were working full time or had children to mind. Many of the participants intended to make records, such as creating a personal album for their children, but these plans were pushed back until they had more time.

The participants in the study were, for the most part, only at the beginning of **old age**. Over half of the older participants were grandparents, half were retired and the other half worked part-time. In the previous stages, we mentioned that people tend to initially

for the older adults to collect or save items. This contribution was threefold. Firstly, the participants collected items, such as heirlooms or photographs from past generations. These were often treasured items such as a watch or wedding band passed on from grandparents or parents. The older participants expressed regret that they had not recorded more from the lives of their parents, such as recording their voices. Secondly, the participants gave or gathered information to create a family tree. All of the older participants had a keen interest in their family history and felt that it was important for future generations to be aware of their family lifeline. Death motivated the participants to gather artefacts relating to their family history but with death there was a loss of information. The participants reported that although family stories were commonly told, at the time they were not interested in documenting them. It was only after the older generations had passed away that it was realised that these stories were buried with them. Another problem the participants faced was being able to trust the authenticity of the information obtained, particularly those found through Internet sources.

Lastly, the older participants talked about the importance of documenting life in some way. This was seen through motivations to update old media to digital format, saving newspaper clippings about important world events that happened or collecting personal documentation to convey a story of the person's life, for example. The older participants talked about how collections that they saved in younger years, such as the bill from their wedding, gained significance throughout the years. Over time these documents made a transition from formal paper work to a record of significant events. It is through these collections that we can see the person that they were and as well as the person they became. In the same way, we believe that lifelogs would increase in significance over a person's lifetime, particularly at a time in their lives when they begin to review their life, conflicts and accomplishments.

Collections within Family Groups

It was clear from the interview findings that family was at the core of life-long collections, particularly for the older participants and the younger participants with children of their own. However, for all of the participants, sharing and story-telling within the family group contributed to reminiscence, conversations and fun. It was found that parents, particularly mothers, paid great attention to collecting items for their children so that they would have mementos from when they were a baby, or in school. Children were a significant motivation for collecting behaviour. Photographs or videos of children were shared with grandparents and siblings. Our participants said that they frequently send or receive photographs from family through mobile phones, online photograph software or printed copies. These examples show how involved a family network can be in capturing and reviewing collections. Sharing between families is intergenerational, with each generation sharing information from their own experiences.

The triggers for reviewing collections were common to the younger and older participants in the interview study. The one trigger that stood out was reviewing collections following a *death* in the family. It was because of the age of the older adults that they were more likely to have experienced the bereavement of a parent, sibling or friend. It is after such events that people must organise the belongings of the deceased, which in turn prompts story-telling and reminiscence. So here we have two extreme motivations for collecting, reviewing and sharing family artefacts: life and death.

The main aim of this research is to inform the design a lifelogging application that would be relevant to older adults and one that they would be interested in using. These findings point towards a system that incorporates family and sharing. In the next section we discuss some of the implications for the design of such system.

Implications for Design

Participant motivations for collecting life-long items can help guide the design of a lifelog system. These motivations tell us why people collect or keep different items and what they do with them. For example, a person might keep a photograph because of the sentiment attached to it. They may want to share this photograph with others or reflect on the past when they see it. There may be many motivations attached to a single item. Therefore a digital lifelog should support all of these motivations. In this section we present considerations which may guide development of a lifelog application.

Designing for Intergenerational Use

We learn about our past from the stories that our parents and grandparents tell us. Having a visual artefact, such as a photograph, can significantly enhance story-telling and shared family reminiscence. Lifelog images captured by mobile devices can tell us even more about the past as they capture large quantities of images from everyday activities. These images could be of our past, our parents' or grandparents' past, or the lives of family members that have gone before us. This would give younger family members a unique opportunity to question older generations about captured events, or if they did not know or remember an event, then deciphering the activities together. By focusing the design on both older and younger users, we can support family interaction and intergenerational use. This includes designing interfaces that accommodate older users' capabilities and utilising technology, such as touch-screen devices, with which both older and younger people can easily interact.

Design for Changing Motivations

People of different ages and at different stages of their life have different motivations for collecting. The meaning of collections can also change over time. We form a stronger attachment to them or they become important for different reasons than those when they were originally

captured. To accommodate family members of different ages using a lifelog browser we need to provide support for these changes. We believe that this can be done by supporting both the short-term and long-term use of a lifelog system. Short-term everyday use can be supported by mobile real-time access, providing recent updates on family members' activities (such as updating when an event can be shared), facilitating users to combine images from a shared activity, and highlighting events and activities for a user to browse through. Long-term use can be supported through summarising lifelog activity, building a family tree network and allowing users to search through past lifelogs.

Making Use of Individual Contributions

In all of our participant's families there was a person who was creating or at least interested in creating the family tree. In some cases these family trees were passed down and developed through the generations. Although the younger participants were less interested, they did believe that interest would come as they got older. Gathering information about family history can be overwhelming. People put off creating a family tree because they don't have the time, they're not sure where to look, or they do not trust the accuracy of the information they find. Creating a visual lifelog is a way of preserving a record of events, and in a family lifelog if all family members created their own record, any shared information can then be used to create a family network, or family tree. This family network could evolve through the generations, keeping an ongoing record of people, their birth, their activities (those they chose to share) and finally their death.

Supporting Image Sharing

Sharing is one of the main motivations for collecting items throughout one's life. The way in which people share their lifelog images can vary depending on the relationship they have with other people, whether people are present at the time of browsing, or the level of interest

in the images themselves. To accommodate for this it is important to support in-person group sharing as well as remote sharing (from device to device). Mobile technology, such as a touch-screen tablet, can support sharing in a family group as more than one person can view and interact with it at any one time.

Although the participants in our study were enthusiastic about sharing their collections with family, there were also items that were considered to be distinctly personal. Therefore a user of a family lifelog would have to have access to their own private accounts from which they can add certain items to a shared family account. The interview findings showed that collections shared with family members were most likely related to other family members or events. Allowing users to combine lifelogs from a shared event would enhance their records and browsing experience.

Giving Control to the User

Preserving privacy for personal collections may prove to be a challenge for digital archiving, particularly when several family members are using the same PC in the home. The level of privacy that we expect for our collections is easily established through physical artefacts by the way they look, or where they are stored but this distinction is not as easy to identify for digital collections. Massimi and Baecker (2010) explored how people inherit, use and reflect upon digital technology following the death of a family member. They found that devices were shared between family members in the home, however the bereaved reported having to face ethical dilemmas when trying to organise the deceased's digital remains, for example, trying to determine what information was private and discovering information about the deceased that was previously hidden. It is our belief that a clear set of guidelines is needed with regard to lifelogging, which takes into account the privacy and ownership of lifelog collections within and after a person's lifetime.

CONCLUSION

These findings suggest that the value of collections gradually evolve over a person's life, often collected for personal use, then shared with others and eventually recorded with the intention to pass down to future generations. It is possible that lifelog data could be collected and used in the same way. Collecting a lifelog over many years and into old age would mean that individuals would potentially be able to pass on a rich narrative of their lives and perhaps the lives of family members before them.

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