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## Getting *into* the Living Memory Box: Family archives & holistic design

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**Abstract** Digital archives of personal memories are becoming increasingly technically feasible, but there remain significant interaction design challenges. In this paper, we present a research and design study of the Living Memory Box, a device and service to assist families in preserving memories in a variety of media forms. Through a series of ethnographic interviews, design activities and focus groups, we have developed recommendations for the design and development of future personal memory systems and appliances. These improvements must be considered by future researchers in the coordination of multiple disciplines toward successful holistic systems.

**Keywords** Domestic technology · Ethnographic studies · Family memories · Focus groups · Home appliances · Industrial design · Multimedia organisation · Ubiquitous computing

### 1 Introduction

At its very core the Living Memory Box project is about people, their experiences, hopes, dreams, pains and pleasures – and how we seek to capture these experiences. How can we best complete the task of memory capture with current software and hardware technologies? One of the general themes in HCI and ubiquitous computing is the construction of devices and applications to support the automated capture of live experiences and the future access of those records [1]. Ever since the vision of Vannevar Bush's memex [2], researchers have understood the value of these automated capture and access services, and have striven toward this functionality, primarily in the workplace. Over the past decade, the

technologies have advanced enough that the essential functionality of the memex is no longer imaginary.

Interaction design questions have recently become more urgent as technologies have rapidly evolved. We must ask if the systems and technologies created match the often deeply emotional memory capture and access goals of everyday people? The emotional context is particularly relevant for memory capture in the home. Theories like affective computing [3] begin to help us build these computers, but it does not address the form that such computers will take in our homes, the user needs they will fulfill and the additional ones that will be created. Although the long-term creation of these systems seems certain [4], how do we begin to appropriately address these issues in the home environment – particularly for physical and virtual components?

Industry leaders such as IDEO [5] have focused on creating experience requirements from interdisciplinary collaboration. Drawing on this example and others, as well as our belief in holistic design, we have performed similar research on the Living Memory Box project at the Aware Home Research Initiative (AHRI) [6]. We have gathered a list of initial recommendations both by and for designers and technologists. These recommendations lay the groundwork for developing systems and appliances that not just invent helpful technology or develop attractive interaction design, but integrate the expertise of a wide variety of disciplines for a holistic experience that is both incredibly helpful and emotionally engaging.

#### 1.1 Related work

Related studies in this field have focused on distinct segments of family memories: collection, organization/browsing, retrieval and/or sharing. PhotoMesa is a well-known approach to serendipitous visual browsing and access to ever expanding digital archives [7]. Balbanovich looks at storytelling with digital photographs – and how one could enable this with a specialised device and software [8]. Bell tries to save *everything* and create an

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accessible record of this captured life [4]. Lieberman's ARIA system investigates how to integrate an agent that can make proactive connections between your e-mail collection and photo archive [9]. Shneiderman has developed ways of annotating collections through drag and drop direct annotation [10]. Rodden investigated how people organised (or did not) their own personal collections, and then asked how similar collections should be displayed on the computer [11]. These publications add to the growing body of work addressing personal memory systems. While this segmentation is understandable, given the complex nature of this domain, researchers need to begin to look more broadly at the short and long term needs of users, and how to support these throughout the design.

Of all the recent publications, the most comprehensive look at the kinds of requirements that systems would have is Frohlich's investigation of *Requirements for Photoware* [12]. In particular, they have developed a matrix that outlines notions of sharing and retrieval through a grid of same/different place and same/different time. Their system would support all of these functions in the matrix – providing a number of different ways to capture, annotate, retrieve and interact with the archive. Unfortunately, there is hardly any mention of users' collections of physical artefacts, other than photographic prints, saved by individuals and families, which could be incorporated to further enrich the Photoware collections they described (although Frohlich has addressed this in another publication [13]).

## 1.2 Overview of the paper

This paper examines the research and design of a user-centred system to support the goals embodied in the collection, archival and annotation of memories of a family's life. We are interested in how the effective implementation of manual and automated capture and access services to gather and annotate family events can be leveraged to assist and enhance current methods. We describe a series of ethnographic studies, design processes and focus groups that have informed our understanding of how and why people collect various artefacts. The data from these formative and summative processes have informed the current and future designs of physical and interactive prototypes for the Living Memory Box and other projects in the AHRI. We believe that the development of effective and appealing systems & devices requires collaboration and development by cross-functional teams.

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## 2 Understanding user goals

To understand the goals of families in memory collection, archival and annotation, we have conducted both a series of qualitative interview studies and a number of focus groups. Our initial research focus was on how to

support a specific and common form of family archiving —parents wanting to preserve memories of their children as they grow. Once we had analysed the interviews and developed key findings, our goal was to bring the idea to a broader focus group of photoactive families and individuals. To communicate our vision of the Living Memory Box we built physical and interactive prototypes, both key in providing something for users to give direct feedback about. Additionally, the focus groups allowed us to check-in with users, while also expanding our recommendations for future systems. In every phase of our research we found indications of both delight and frustration with current saving methods, which we will describe below.

### 2.1 Ethnographic interviews

Our ethnographic interviews were conducted within the home environment with thirteen parents (11 women and two men) whose children ranged in ages from four weeks to 29 years. Topics covered the *who, what, where, when* and *why* of saving memories of their child's life (see Bandlow et al [14] for a detailed report of these interviews.)

Results from the interviews indicated that current methods are increasingly inadequate at satisfying their memory gathering needs, although there are more technologies to assist them. Parents are confronted with a wider variety of artefacts from in a larger variety of media (videos, tapes, objects, artwork, etc.). Additionally, although there are some existing systems to assist in either digital or analogue organisation, most of these commercially available solutions address the storage of the physical manifestations exclusively (photo albums & boxes, video cases and cabinets, etc.) [14]. Nearly all participants indicated a *constant* search for ways to 'save' or 'capture' special memories from their child's life. While saving artefacts is ostensibly for a joyous purpose, parents expressed a high level of guilt and anxiety that they were not saving enough, saving too much or possibly saving the incorrect items.

(I keep) as much as I can stomach keeping, and justify. And I'm sure, someday, my kids are gonna go through my attic, and go 'Oh my god, look at this junk.' [14]

Although we often imagine that photos are the primary bulk of family collections, the photos serve as the most clear and concise story of the items currently saved. Indeed, we found that other physical objects make up the majority of the archive that a parent retains, and in contrast these items can be potentially the *least* expressive to outsiders and the most expressive to parents. Without a detailed record of why an object was saved, the entire archive becomes a vast unwritten story, unknown to those outside of the events themselves, but still highly valued. One mother said

I mean, if you looked at it, you might throw it away. But I would die. [14]

If simply saving all of these artefacts is already a struggle, then recording stories about these artefacts is an insurmountable obstacle.

There's so much stuff, and so little time to...you know, I'll get a little time, and I'll put it off, because I'll think to myself, "I can't start that right now. I'll never finish." It's an overwhelming amount. [14]

Annotation may be perceived as important, however it is a task that often comes last and is done on borrowed time. Add into this mix multiple technologies creating physical and virtual artefacts in great numbers and we see what should be easy and fun quickly turns into something that is at best difficult and frustrating.

## 2.2 Findings

The interviews provided us with a great deal of data about the current practices of parents and how we can address the problems that they face. The key findings from these interviews can be summarized as:

- Remove the 'work' from collecting, annotating and revisiting memories;
- Make the inclusion of physical objects a primary feature;
- Develop 'natural' interactions (i.e. touch and voice);
- Enable storytelling through centralisation of artefacts.

Given these guidelines, the next step was to outline the combination of capture devices, archives and associated services that could realistically enhance the memory archiving experience of today's families. To illustrate our vision of the Living Memory Box we used two main tools: visual models [15] and role-based scenarios of use. The visual models addressed three main areas, cultural context, artifact paths and changes in the archive contents over time [14]. The design scenarios expressed in a story the vision ideal interactions, on both the emotional and technological level in clear terms understandable by a range of design professionals.

## 3 System form and features

These models and scenarios were important points of contact and understanding between the varied members of our team [16]. From the discussions that evolved from these scenarios and models, we developed physical and interacting prototypes to illustrate the core concepts of the Living Memory Box project. Through collaboration between computer science, industrial design, user interface design we were able to envision a holistic design that supports the key findings [17]. The system is composed of three pieces:

- a central storage/display device ('the box');
- one or more portable personal recording device(s);
- the interface & network.



**Fig. 1** The physical model of the Living Memory Box. Designed by Florian Vollmer

### 3.1 The box

The box itself (see Fig. 1) is the centrepiece of a potential array of digital devices and capture and access services, which would be used for input to a centralised archive. The Living Memory Box appliance can be seen as both an archival and narration device, allowing families to bring together artefacts and then tell stories about those particular items [8]. The box acts as a gateway between the physical and electronic worlds, with artefacts as transitional objects, placed in the box only for the moment of recording. The space within the box creates a transition between the concept of storing physical artefacts and storing within the digital realm.

We cannot anticipate the volume of storage demand, and therefore our box cannot be the storage place for the primary physical artefacts. Other projects have been successful with boxes that store objects and associated audio files [13], but the space limitations, and the inability to link to images or video, make this an impractical solution for our users. The device should leverage the *metaphor* of the box in its form and interactions (Fig. 1). Our studies revealed that the box is the primary location for family archives, and should be a familiar and comforting metaphor to draw on. Essentially, the user should be able to 'place' an item into this 'safe' area and imagine that they are 'saving' the item for posterity. Then at a later time the user can access this recording through the device to revisit the object and its associated memories.

The physical appearance of the box reflects its status of the keeper of family records, while also inviting touch and interaction. The platform where objects are placed

within the box is made from wood (a symbol of longevity and vitality) giving a pleasing background to the objects being photographed. The plexi-glass walls allow light to fall upon the objects placed in the box, while also enhancing the appearance of value and clarity.

### 3.2 The recording device

The Living Memory Box has at least one dedicated external, removable, capture device that is synchronized to the box for the recording of stills, video and audio. The box also has an internal imaging device on the back of the screen that will create an image of physical objects placed inside the box.

Metadata (date, time, place) should be attached to *all* entries within the box, eliminating the most boring and painful part of the ‘saving’ process. The images from events taken with the dedicated device(s) will have the recording date and time automatically associated. The time of capture, while easy to obtain automatically, may not be the most meaningful metadata associated to a given object. Modifying and extending metadata must be supported such as primary owner of the associated recording device.

### 3.3 Interface and network

The interface is a fluid space, allowing any activity to be completed at any time. The transparency of the boundary of the physical and virtual domains is emphasised through the use of computing that leverages the parent’s ‘natural’ interactions. Natural language will be the most efficient and comfortable for a wide variety of users. All audio input will be translated into text for indexing and retrieval within the system.

Metadata associated with a file is available for viewing, but only if the user wishes to do so. There is a search capability for when users are seeking a particular item, but an information visualisation of the entire contents can also be activated for serendipitous browsing [7, 12, 14]. By centralising digital representations of artefacts in the Living Memory Box, we envision a way to help users complete more pleasurable and complex tasks, that is, telling stories about particular events and then linking to related ‘memories’ through the simple interface. The software can then connect through the network to multiple displays or other Living Memory Box users.

## 4 Focus groups

Once the interactive and physical prototypes were completed, we chose to organize a focus group. We wanted to bring the concepts to a new audience and discuss potential interactions with this system, device and interface. Our goals were to (1) check our knowledge with new

users, (2) gather feedback on our current prototype, and (3) use the data to adjust our findings for a broader user group. The prototypes, physical and interactive, were developed to give the clearest impression of the system, while emphasising the system was in process and needed their constructive criticism.

For the focus groups we sought participants from the two ends of the family memory spectrum: at one end, digital camera users and at the other end, scrapbookers (people who express themselves through physical materials to create unique albums with photos, special paper and other mementos). Gathering perspectives from both of these groups was intended to give us the broadest range of reactions from potential end users. Although we had reasonable data about the *collection* of items, we needed additional data about stories and end uses for these personal archives. Participants were recruited through flyers in relevant stores in the Atlanta area and through online groups and list-servs on two major Internet portal sites. We gathered an initial group of approximately 20 people to divide among the three focus groups. Unfortunately, our participation in the actual groups was somewhat low primarily due to a lack of direct compensation.

Our Focus Group protocol involved two main activities: a pre-session photo journal and then several days later a two-hour focus group. We also performed a post-session survey to gather baseline feedback on the system description and interactive prototype.

The interactive prototype was implemented on a touch-screen iMac computer, placed in the main living room area of the Aware Home Residential Laboratory. The form factor of the new iMac, with the screen on the extended arm, closely resembled the original design for the Living Memory Box. We did not implement voice control in the interface, using a keyboard as needed through the demo. The interactive demonstration provided examples of quick annotation, audio annotation, image recognition searches and serendipitous browsing. Artefacts entering the system, remote network sharing and display of the collection were explained, but not demonstrated.

### 4.1 Pre-session journal

During the week before their focus group we asked participants to respond to questions in a journal with words and pictures. Loosely following the *Make* part of

**Table 1** Breakdown of participants involved in the focus group study (\*pilot participants are not included in the total)

Focus group	Gender	Scrap.	Digital	Total #
Pilot Group	2F*	0*	2*	2*
Focus group 1	2F	1	1	2
Focus group 2	3F, 1M	2	2	4
Totals	5F, 1M	3	3	6

SonicRim's *Say, Do, Make* [18] protocol, the journal sought to 'prime the pump' for the focus group discussion. The *Make* part of the *Say, Do, Make* protocol proposes creative activities as a way of successfully opening the cognitive awareness of your focus group participants to your domain of interest. The kit we sent home with the participants contained a journal, an instant camera and two packs of film. Aside from demographic information, the journal had six pages of questions about family memories in their home environment, with a space for an illustration from the instant camera.

#### Photo Journal Questions

- Describe your main place to display images/artwork.
- Do you have other special display places?
- Tell us about where you store your photos/videos and other memorabilia
- Tell us about an object in your house with a story you know, but not many others do.
- Tell us about a photo with a special story.
- Describe the place where most family stories are told or recorded.

#### 4.2 Focus group protocol

The participants came to the Aware Home Residential Laboratory on a Saturday after they had received the photo journals. The outline of our activities during the two hours was as follows:

Activity	Minutes
Intro	5–10
Journals	30–40
Key Words	15–20
Prototype System Description	10–15
Prototype Demo	20–30
Feedback & Survey	10–20

Most of the time was spent discussing the Journals and Keywords at a large kitchen table while the moderator wrote notes on large sheets of presentation paper. The interactive demo was conducted in the nearby living room area on a touch-screen iMac computer.

##### 4.2.1 Journals

The participants expressed two main emotions that they felt while filling out the journals: enjoyment and surprise. These were somewhat competing emotions, as the enjoyment of sharing the special things about their family was tinged with both happy and unhappy surprise at the amount of items (large) and the organisation (small). One set of participants agreed that the items in their collections all had an organisation, but that it was an entirely personal index.

The journal question about objects, "Tell us about an object in your house with a story you know, but not

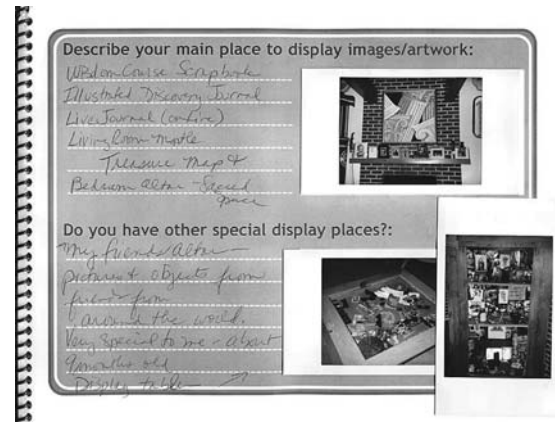


Fig. 2 Example journal answers to display questions

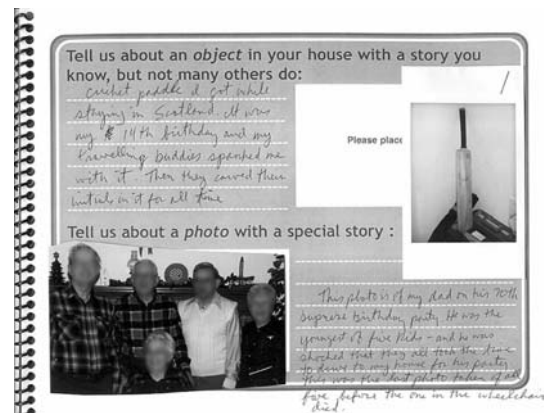


Fig. 3 Example journal answers to object and picture questions

many others do" generated a good deal of discussion (Fig. 3). While participants were surprised by the question, they were all able to identify an object in their house to answer the question.

Overall, we felt the journals were very successful in preparing the participants to discuss family memories. Participants were able to draw on their own archives: pictures, boxes, albums and objects. Particularly items that they had seen while filling out the journal. They then drew on these for examples to illustrate their points during the focus groups.

##### 4.2.2 Keywords

Participants were generally positive about computers and digital photography, there were reservations expressed. Words that were used to describe the term *digital photography* included 'exciting' and 'flexible', as well as 'cold' and 'elitist'. Digital was additionally seen as expensive, risky and too much like 'work'. Said one participant, "I don't want to go home and use a computer, when I just spent 10 hours on one at work". This participant and another scrapbooker said that they

would not switch to digital because of these concerns, however they both got their rolls of film with a CD-ROM of photos – “Just in case I need them later”. Both clearly foresaw a conversion to digital in the future, however there was not a convincing reason to switch at the moment.

#### 4.2.3 Interactive prototype

The respondents reacted very well to the multimedia aspect of the interactive prototype and most could envision instant application in a variety of fields, including hobbyists, sports fans and museums. Users were supportive of bringing this process away from the personal computer. However, many were concerned about the long-term durability of the Living Memory Box and its contents. Five of the six participants filled out the exit survey at the end of the session. One user indicated that “the prototype seems to duplicate already existing technology – (the idea) could be adapted immediately with software (specific) that could utilise user’s already existing investment.”

#### 4.3 Key findings

Overall the participants were positive about the system as described and demonstrated. The feedback surveys expressed worries about the ability to address these issues within budget and complexity, but it did not dampen their enthusiasm entirely. Four out of the five survey respondents indicated that they were “very interested” in the Living Memory Box. The fifth respondent was single and without family, making this a less appealing product.

The responses supported our initial findings, but also added and extended the key issues.

Recall the four key findings at the end of the interviews, and revise and expand them to the following recommendations:

- *Develop the annotation/organisation into a time of personal expression.* Do not simply remove the ‘work’ feel of current annotation methods but sculpt the interaction design to make it a time of personal expression for the user. The scrapbookers from the focus groups all described making the books and journals as ‘therapeutic’, something that could add significantly to the user experience. The appeal of the physical device could enhance this feeling.
- *Make the inclusion of practically any object possible.*
- *Bring the interaction away from the PC.* Participants in each group found that the prototype developed was appealing and several mentioned their happiness that it was not personal computer based.
- *Develop ‘natural’ interactions (i.e. touch and voice).* Users expressed particular interest in saving the audio of voice for the emotional context.

- *Encourage storytelling at any point.* Develop ways of promoting storytelling that encourages and allows users to tell stories about their experiences at any point in the process. For example, while taking pictures at a child’s birthday – you can record an audio of everyone singing happy birthday. Then you can tell more details and associate them together contextually.
- *Ensure the capability of multiple ‘voices’.* Include annotations from many users, allowing multiple perspectives that can be identified as such.
- *Create unique experiences.* Make the experience of creating annotations and the experience of viewing them unique in their interaction, emotional content and long-term relevance.

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## 5 Future Work

There are several related projects being developed within the AHRI. Currently, HCI and psychology researchers are interviewing groups of older adults about their feelings, concerns and hopes for an aware environment. In this study, participants are given a tour of the house followed by a structured interview, that highlights various projects in the AHRI. Initial results for the Living Memory Box show that the design is appealing to a large group, but not to all users. Additionally, while the majority of users saw an immediate *value* to the box, there was a distinct divide between usefulness and enjoyment. Usefulness comments focused on documentation and finding lost objects, while enjoyment comments focused on recording personal stories and images. Users also described concerns about the intrusion of a camera device and how much control they would have over taking images and videos.

Currently, we are creating a working Living Memory Box prototype to place in a field study. Through this we will begin to gauge the effectiveness of the system as a whole by measuring its use and acceptance by everyday users. This is particularly important in learning more about how it should function as a device within a household. As Petersen has noted, it is the users actions and explanations *in situ* that can provide us with a deeper understanding of the role this device would play in the everyday lives of the occupants [19].

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## 6 Conclusions

The need for computers to focus on user’s information needs and relationships is an increasingly emphasised research challenge [20]. Shneiderman identifies a pattern of ‘collect-relate-create-donate’ as the continuum of users information goals over a period of time. Currently there is no single device that brings together the four stages involved in this cycle with family memories, in particular as it relates to both digital and physical artefacts. The inability to organise and bring this collection into a coherent story line does not result in reduced

collections; rather, it decreases the long-term narrative potential of the collection, and the inability to ‘donate’ to others.

I used to have time and interest in organising. Now I just have interest in having stuff, but not time and maybe not interest in organising it. [14]

Using our recommendations and the innovative application of interaction and technology design we are developing systems that address every stage of a families’ personal information needs. Only this holistic application will create technologically innovative and emotionally expressive experiences that allow users to preserve the past, enjoy the present and face the future.

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