Making History: Intentional Capture of Future Memories

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ABSTRACT
'Lifelogging' technology makes it possible to amass digital data about every aspect of our everyday lives. Instead of focusing on such technical possibilities, here we investigate the way people compose long-term mnemonic representations of their lives. We asked 10 families to create a *time capsule*, a collection of objects used to trigger remembering in the distant future. Our results show that contrary to the lifelogging view, people are less interested in exhaustively digitally recording their past than in reconstructing it from carefully selected cues that are often physical objects. Time capsules were highly expressive and personal, many objects were made explicitly for inclusion, however with little object annotation. We use these findings to propose principles for designing technology that supports the active reconstruction of our future past.

Author Keywords
Autobiographical memory, cultural probes, fieldwork, lifelogs.

ACM Classification Keywords
H.5.2. User Interfaces and H.5.m Miscellaneous.

INTRODUCTION
Storing and accessing information relating to personal memories is a widely recognized computational challenge (e.g. DARPA's LifeLog and EPSRC's Memories for Life initiatives). Various new technologies allow people to capture an enormous mass of personal data using 'lifelogging' tools. The lifelogging vision is to capture 'everything': every event we experience, conversation we participate in, and any piece of digital data we ever touch [1, 17, 19]. According to this vision, these accurate digital records can then be accessed to re-live past events. However, with few exceptions (e.g. [14, 27]), most lifelogging work has focused on *technology*, rather than on *understanding the nature* of long-term remembering.

CHI 2009, April 3-9, 2009, Boston, MA, USA.

Instead of focusing on tools for capturing the minutiae of one's entire life, this paper looks at the human side. Our aim is to better understand what people would like to remember of their past and why. We explore the motivations behind intentional experiential capture, examining what people consider being valuable long-term mnemonic representations of their lives. To do this we asked 10 families to create a *time capsule* (Fig. 1): a collection of items to represent themselves and their lives - to be viewed 25 years in the future.

"*I would have never done it, but there was a reason and it was just fab. I enjoyed it greatly*!"

Figure 1. A time capsule, its contents, a co-creator's comment.

In particular we wanted to address the following questions:

- *What* do people want to remember in the long-term? Are they more interested in people or experiences? Do they emphasise important events or more mundane aspects of everyday life?
- What *types of objects* are chosen as long-term memory cues? Are these representational objects, e.g. photographs, theatre tickets, or are they more symbolic, e.g. a child's first tooth or pair of socks?
- *Why* do people want to remember? Do they want to recall facts about their past, to reminisce or to preserve significant objects from their lives?
- *How* is remembering going to happen? Is the time-capsule intended to support *veridical recall* of events as lifelogging suggests? Or will it function as a set of more fragmentary *cues* for the *re-construction* of meaning in the recall context, as work on autobiographical and collective memory claims?

Understanding these issues is fundamental for the effective design of digital systems that support long-term remembering.

RELATED WORK

This topic is interdisciplinary, relating to work in psychology, sociology, material culture, computer science and technology. Each area takes a different perspective.

Work on autobiographical memory within psychology documents its neurological basis [11], development [21], consolidation [4] and decline [23]. Recent theories emphasize *narrative* - claiming memories are not fixed but continuously reconstructed within a social context [31].

Theory in sociology claims the context of recollection changes the reconstruction of memories [13], arguing rituals are fundamental for the transmission of collective memories in the form of tradition [3].

Material culture examines the spaces people inhabit as autobiographical representations [12], the meaning of objects in people's lives [6], how mundane objects become evocative of life events offering comfort during important life changes [2,30], and how heirlooms provide a fine-grained understanding even of a distant past [18].

In HCI, in addition to lifelogging, studies of personal digital memories focus mainly on photos. Of particular relevance here is social story telling as a way to contextualize photos and construct families' self representations [5, 7, 28]. Some technology research looks at the role of memories in people's lives. [8] finds that souvenirs enriched by audio narratives are valued by adults only if given/received as presents. [29] shows that parents actively collect children's mementos, but fail to capture narratives related to those objects. [32] explores the potential of physical-digital tools for mixed reality and mixed media scrapbooking. In [15] digitally augmented RFID-tagged physical objects were used to retrieve a set of previously associated images.

Recent work has looked at the value of visual [14, 27], or sonic content [16, 22] for personal recollection. [25] shows mundane objects or artwork are more representative of autobiographical memories than photos or digital content.

THE CONCEPT AND METHOD OF THE TIME CAPSULE

A *time-capsule* is a way of leaving traces of our life for ourselves or others to discover in the future. It is an intriguing idea that captured the imagination of many, including artist Andy Warhol who assembled 370 such boxes in 13 years. It has been used in educational settings, community and art projects. In this study, the process of deliberately composing future-oriented mnemonic representations in a time capsule was a playful way to engage our participants in reflecting on their daily lives and memories in the distant future.

Participants

We invited families with young children to create their own time capsules to be opened in 25 years time by their (yet unborn) grandchildren. Selecting these families allowed us to contextualise the study in a familiar setting, that of the children becoming parents. Parents of young children also see themselves as active curators of their children's 'future memories' [29]. We recruited a middle class sample on the basis of [6]'s finding that they are oriented towards memories and relationships - in contrast to other social groups who focus more on possessions. In total, ten families, 20 adults and 19 children (9 boys, 10 girls), participated in the study. The families were recruited by acquaintance and the adults covered a range of professions (teachers, museum conservationist, high-level managers, architects, writers, nurse, doctor, Anglican priest and 5 academics). All families were regular users of digital technology, e.g. digital cameras and computers. The average age of parents was 45 (38 to 54) and for the children 9 (5 to 14). All families but 1 had 2 children.

Reflection and Creation Stages

The study consisted of: (a) an initial reflection phase, to decide what was important to capture, (b) a creation phase when the time capsule and its contents were created.

Reflection started with an introductory explanation and the handing over of a set of cultural probes [9]. The probes (see Fig. 2) were intended to inspire participants when composing their time capsules [10]. They were designed specifically to provoke reflection about participants' *past* - what they might like to remember from 25 years ago – as well as the *future* - what they might want their grandchildren to know 25 years from now.

Figure 2. Probe sets (left) and individual probes (right).

The probes included: a 2-week diary, '25 year' notepads (to reflect on what they might want to recall from 25 years ago), a local map with stickers, cue cards with "who, what, when, where, how" to remember, shaped post-its for 'messages to the future', scrapbooking materials, and a questionnaire.

By keeping a 2-week diary and recording their movements on the map, we oriented participants to the notion of careful information capture and the procedures and goals of lifelogging. By asking older participants to reflect on their distant past, we intended to make them familiar with the process of recalling very old information and the cues that would be needed to do this. The reflection phase ended after about 10 days with an informal interview on the probes and plans for the creation phase. This phase required families to create their own time capsules and contents. No

restrictions were given except that each family member should contribute. It was made clear that sensitive content could be included in a sealed form and would not be inspected, but an idea of the content should be provided. We explicitly invited participants to include digital objects in any form.

When the family felt ready, after about a month, they presented the time capsule and its contents to us. During the final videotaped meeting, which lasted 1 to 2 hours, family members described each object, explaining what it was and why they included it. Questions about the overall experience concluded the creation phase. As a token of our appreciation we gave each family a photo printer.

Data Analysis

Space limitations prevent us from discussing the used cultural probes, despite their effectiveness. Instead our analysis focuses on the contents of the time capsules which were photographed and catalogued before being returned to their families for final storage. Video interviews were transcribed, systematically analysed and classified. Interview coding was rooted in participants' descriptions of objects. Key phrases were labelled and clustered by affinity, i.e. topics that reoccurred in interviews became categories. Indexing and counting were used to highlight phenomena.

We categorised the *types of objects* stored in the time capsule, i.e. whether they were photos, significant objects, ephemera, craftwork, essays, videos, or publications. We also determined *what those objects referred to*, i.e. people, places, events or things. Nearly all objects had a single major referent; the few objects with multiple meanings were classified with respect to what was considered the dominant one. For example a photo of the children sitting on a tree described as "*this is a place where the children like to paddle. It's S's favourite place, Padley Gorge*" was classified as 'place' instead of 'people'. We also classified the *type of memory* each object engendered i.e. what memory function was being served, such as recall, reminiscence, or simple preservation.

To further understand the mnemonic functions of the collected objects, the 369 items were classified with respect to Peirce's [24] typology of signs associated with objects: icon, index, and symbol. An *icon* shares qualities with its corresponding object, i.e. by resembling or imitating it. A photograph of the family house acts as its icon; newspapers, technology samples, holiday photos, maps are all examples of icons. 'My favourites' and diaries were classified as icons as participants described them as related directly to themselves and their experiences. An *index* relates to an object via a physical or causal connection. Swimsuits and sailing maps are indexes of a family's passion for water-sports; recipes, scout badges, children's craftwork, school reports, awards and medals are all examples of indexes. Shopping bills were included in this category because their purpose is not purely representing the cost of commodities, but to indirectly represent what the family bought. A *symbol* denotes its object solely for those who are able to interpret it. "*Ballet socks, actually not a pair nor pristine. They tell a lot about how we are: we do things but we are not hugely organized and we do not mind too much about certain things*." A knife and fork, flower-shaped hanger, and a letter to the future are all examples of symbols.

Homogeneous sets of objects were classified in groups, e.g. photos, VHS cassettes, children drawings, unless their individual value was made explicit, e.g. videos of a house and a birthday party counted as two instances.

FINDINGS

Participants greatly enjoyed the process of constructing time capsules and were highly animated when describing them. They took the construction process seriously as evidenced by the fact that, despite them being extremely busy, many objects (craftwork, photo collages, messages to the future) were *deliberately constructed* for the exclusive purpose of including them in the time capsule: "*It was an enjoyable activity. Although we have been very busy and we didn't have much time, we could have gone on for months"*, *"It has been very interesting, we have done a lot of things and caught a lot of things for this that we would have probably have let slip by."*

In the next two sections we first describe what the contents of the time capsules were and what they looked like, then we discuss in detail the meaning behind: the types of memories, reasons for storing and what this tells us about how people want to remember

What *objects* serve as memory cues?

Deliberately Constructed: In line with [8, 25, 29] we expected the time capsules to contain small collections of precious objects participants selected from existing long-term belongings. But *belongings* accounted for only 37%: and of these, very few were older possessions (4%), instead the majority were from the last 4 years.

To our surprise, participants put a lot of effort in assembling *new content*: 37% of objects were created for the sole purpose of being included in the time capsule, a further 26% were deliberately collected for this reason. This is an important result not only because it challenges the lifelogging notion of passive event capture, but also because it shows the level of commitment and interest that the overall project engendered in our participants.

Objects made for the time capsule included photos, scrapbooks and writing, but also photocopies or scan-and-print copies of unique items like a home address book or photos of great-grand-parents. The selection process depends on the *type of memory* participants want to capture. If the function of the object is symbolic, e.g. the photo of the 2nd of May 1997 discussed below, the selection is very careful and precise. If instead it is representational, capturing everyday life, a random sample suffices: "*[music brochures/leaflets] are fairly random because they are not more important than others we could have chosen, they just*

happen to be there." However random, the sample must be detailed: "*We wanted something that is a sample of life, it has to be a fairly random thing but described in quite some details. The detail then becomes important because you do not know what it is going to be*." It is important they are 'a samples', not an exhaustive record: "*the last supermarket shop receipt. You do not want to keep much of this sort of stuff, but it brings back all flavour of the time. You could be quite surprised about what you were doing 20 years ago.*"

All 369 objects were initially classified with respect to their physical properties, see Table 1 below.

	photo (98)	thing (80)	craft-work (60)	ephe-mera (49)	essay (38)	publi-cation (33)	video (11)
F1 (42)	12%	17%	21%	24%	12%	14%	0
F8 (31)	23%	16%	10%	23%	10%	19%	0
F2 (48)	12%	60%	0	4%	0	24%	0
F4 (63)	12%	14%	33%	14%	14%	3%	9%
F3 (27)	25%	36%	11%	14%	11%	4%	0
F6 (30)	26%	19%	26%	3%	10%	6%	10%
F7 (21)	32%	16%	16%	5%	26%	5%	0
F5 (42)	37%	7%	16%	21%	14%	5%	0
F9 (40)	56%	15%	10%	12%	5%	2%	0
F10 (19)	60%	10%	10%	5%	10%	0	5%

Table 1. Fx represents a family, (x) the number of objects included and x% the types of objects each family favoured.

<u>*Photos*</u> were the most popular type of object accounting for 27%, showing the dominant belief that visual cues can trigger memories ("*there is nothing as good as a visual trigger to help you remember lots of other things, even keeping a diary would not necessarily be as thorough as a visual stimulus*"). Photos were mainly used to remember *people*: 13% depicted oneself, 6% family, 21% others (teachers, friends, relatives), and 5% ancestors. Photos showing *places* were popular (26%), just as experiences of events or everyday life (24%). A small minority of photos showed *today's world* (3%): e.g. photos of contemporary technology such as TVs, computers, cars and streets.

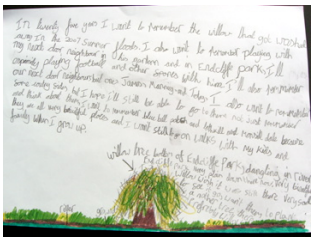
The majority of photos (54%) were deliberately taken for the time capsule to capture what was not commonly recorded and which might have been easily forgotten. The most commonly depicted people are not family but friends, distant relatives or acquaintances: "*childminder and after school club… these are all pictures I would not have taken of the people who look after the girls and they would have just disappeared.*"

<u>*Things*</u> is the second most popular type of time capsule object, 22%. It includes objects that were *once in use*, e.g. last year's family calendar, film cameras, mobile phones, tamagotchis; *personal belongings*, e.g. necklaces, first shoes, piano books; *awards and certificates*, e.g. spelling awards, medals and trophies. Participants also included a number of objects they thought iconic of the current time, "*plastic cards [library card, credit card]: plastic is very much like 'now'*", or objects that could disappear, "*This is a book, made of paper, you know. Will books in this form still be around in 25 years?*"

<u>*Craftwork*</u> accounts for 16%: drawings, paintings, models, webpages, scrapbooks done at home or school. 72% of craftwork was done by children, 28% by parents; 58% were *purposefully created* for the time capsule and 42% selected from an already owned collection. The selection criteria also differed across families, as from these quotes all commenting children's drawings: "*these are mushroom houses. My grandma did that one, I did that one [....] I wanted to remember what I did with grandma when I am 32*"; a painting of a panda on Chinese paper "*it is the best painting that M [aged 7] has done so far*"; 4 little paper note drawings "*the sort of things that in 25 years time will have a completely different significance just found in there. I don't have anything like that from when I was 7.*"

<u>*Ephemera*</u> (13%), items – generally printed – of short-term use or popularity that are not expected to last: "*bits and bobs, sort of things that otherwise will be thrown away"*, e.g. theatre, cinema and train tickets; postcards; shopping bills; brochures; bank statements and school reports. Many are included in anticipation of their disappearance in 25 years time, "*a Visitors' Parking Permit that may or may not be useful in 25 years time. Maybe not because probably there will be less cars around I guess*", "*bank statements won't be around in 25 years time. They are beginning to fade right now as all saving can be looked at online*".

<u>*Essays*</u>: Writing of different sorts was classified as essays, 10%. Examples are: "*a couple of short stories I've been writing […] It was the deep of winter when, you know, you are looking for something constructive to do. It was a big thing during the year*"; "*I [aged 14] printed off computer screenshots of MSN [chats]. Just thought it's gonna be nice [to see] what I talked about to my friends*". Schoolbooks and various children's writings were included in this category. Sometimes the writing was purposefully done to capture today's memories and feelings (see Fig. 3).



"*This is something I wrote about the willow tree that got pulled out of its roots in the flood in the park last year [2007]. Mum and I really really liked it. Now that side of the river looks really plain without it.*"

Figure 3. Example of an essay, 'what I want to remember'.

<u>*Publications*</u> (7%) are public documents including newspapers (national and local); magazines; periodicals; bulletins; 'official' websites; books. Again a copy of a recent newspaper captures today: the local newspaper *"represents where we live, the sort of things people think about"* and *"gives you all sort of information, you know, how much cars cost, jobs, supermarket adverts [for food*

prices]"; a national one for "*the world's facts*." A publication could also be a symbolic representation of one's self, interest or beliefs: "*a copy of the Friend because I am a Quaker and that is a big part of my life*", *"Private Eye*[1] *it will be a period piece for what was going on at that time", "Two books. Stuff I am very fond of now. It would be interesting to see if in the future I still like it"*. It might also provide the context for autobiographical events: "*my brother bought [this newspaper] for me on the morning my mother died. Newspapers are a very interesting cross-section of what is going on in the world as well as a background to your own personal life.*"

Videos, 3%, have a category of their own as participants commented on video's unique value: "*I did a walk around the house as it was without tidying up. I think this would give a better impression of how the house was really like*", "*F and grandma playing a duet at the piano because we thought it would be fabulous for her to watch*".

What are time capsules *like*?

Expressive: The capsules were highly expressive. Looking at them one could infer hobbies, interests, attitudes and in some cases significant events that had happened to the family. The number of objects per family varied greatly with a maximum of 63 objects and a minimum of 19. It is obvious from Table 1 that time capsules were highly personalised, differing in important ways across families. Some families were highly object-focused (F2 and F3). Others were centred on photographs (F9, F10 and F5). These differences represent different meanings that families chose to express. Two main typologies emerged: 4 time capsules were centred on the nuclear family with few references to friends and relatives (F3, F7, F9, F10); the other 6 had a broader focus and captured aspects of today's world and society.

The choice of container was also idiosyncratic, with some families favouring the practical, "*a plastic container to prevent damp*", the symbolic "*all of this will go in an organ pipe*" (the priest's family), or current icons "*5 years ago nobody had wheely suitcase now everybody has*" (see Fig. 1), or complex jokes involving time travel "*we wanted to use a TARDIS*[2] *but could not find one big enough*".

Undigital: We found very few digital objects, despite our explicit request to include them. Of the 369 items in the 10 time capsules only 7% was digital. Another 17% were originally digital but were represented physically: digital photos, scans, IM communications, Bebo pages[3]. This small number (7%) is explained by the fact that 4 families did not choose to include *any* digital content: "*sorry, we are just not digital*", "*you can still see Victorian pictures but if we will be able to see digital photos in 25 years I am not sure*". Since all participating families used digital technology on a daily basis, failing to include anything digital in their time capsules reveals a deliberate stance on the significance and fragility of such technology.

Three other families took the pragmatic approach of including devices, a laptop, a CD player and an iPod, to be able to access digital data in the future. The 3 families who included digital storage (1 CD, 1 USB memory stick, 1 digital tape) expected the technology to persist or they relied on experts to migrate their digital material into future formats: "*maybe USB will still be readable on old computers or maybe not.*" The reason for relying on experts was, in one case, rooted in experiences of being unable to access one's old computer: "*my first computer, my Amstrad, I still have it and it might still work as far as I know but I do not remember how to use it, apart switching it on.*"

Personal: Although certain high level patterns can be found within families, different family members chose objects to reflect their own personality: "*interestingly that reflects how the various members of the family live their lives, because L sort of put in a summary of where she is now in life, you know, there's no rubbish at all; all the ephemera - or what some people describe as waste – is mine. I suppose that reflects my visual dominance and my background.*"

Between families, the same objective, e.g. to record details of everyday life is realised in very different ways: a calendar, a detailed diary for a month, a 2 week summary, or a 1-day photo diary were used. Even when *exactly the same object* was included, the meaning differed from family to family. A bottle of wine in 3 time capsules expressed three very different motives: to represent the family "*We both enjoy wine. It is not that we expect it to taste great in 25 years time, it is just representative*", a focus on change "*good wine is supposed to improve with age. A 35 year old bottle of wine is rather a treasure and it is quite enticing to see what it turns into*", and to celebrate the capsule's opening "*We could turn it into some sort of family event I imagine. Have a time capsule party. I think it will be celebrated*."

From this perspective, the lifelogging digital one-size-fits-all approach does not seem to apply. We need technologies that respect the highly personal nature of people's collections, and that can incorporate idiosyncratic physical objects.

What *types* of memories do people want to recall?

We wanted to understand *what* people would like to remember about their lives. We expected participants' to show a desire to record people, places and events, but much less their attempts to grasp the essence of the world and society as they are today. And we did not anticipate intimate communications they sent into the future.

[1] A British satirical magazine dealing largely with politics.

[2] The police box used as a time machine by Doctor Who, a popular UK TV character.

[3] www.bebo.com is a social media network.

People: Unsurprisingly, this is the single most important memory topic accounting for 43% of the objects. This is split into self (22%); nuclear family (10%); others with close ties - like extended family, friends or acquaintances (9%); and ancestors (3%). For remembering non-nuclear others (e.g. scout/brownies leaders, colleagues, teachers) it is usually a matter of *capturing their appearance* (via photos). For the self and nuclear family it is via symbolic and evocative objects. So there are *self-related symbolic* objects that say:

- who I am: "*[the story of my institution] I wrote 6 months ago which contains 2 or 3 pages of what my role is quite apart from being my view of the whole thing*";
- what I do: "*my 'quarrel buster*[4]*' photo and this is the hat I use when I am on duty*";
- what I like: "*the TV programs that I watch and the channels they are on*";
- what I've done: "*an article that T. wrote about one of the climbs he'd done*".

Similarly *symbolic family objects* represent the identity of the family: "*these are some music things [brochures, leaflets]. Music is very important in our family", "food and recipes: we all like cooking and eating together".* Some such objects represent deep beliefs and values, "*a [charity institution] bulletin to symbolise we do not live only for ourselves*", or very close relatives: "*grandma gave me this dream catcher. It is for when I have bad dreams I put it next to my bed*".

Even when a family photo is included, its meaning does not seem to be representational: "*this is an official portrait [of the family] – it is the day we went to court and adopted M*". The participants' stated meanings of family photos that seemed to transcend the obvious and become more symbolic: "*this picture of F when she was one, it was taken the 2nd of May 1997 the day after Labour won the 1997 elections after 18 years or whatever of Tories rule. We were all very happy, we took the day off and we were up all night. For S and me it encapsulates all the happy times ahead*." The process of selecting that particular highly meaningful family photo from among thousands is fundamental. It contrasts with lifelogging technology that records peoples' lives, but lacks in supporting selection and meaning construction.

Ancestors and family histories were captured in family trees or as (visual or written) clues. The intention seems to be to prompt storytelling: "*a photo of my grandmother's father - she told me stories about him, stories that only I know because only I asked so I feel I have to remember*". In another case clues are written: "*Story of Chris Junie captured by Indians. The rocking chair from the Revolutionary War. Aunt Ella's horseshoe.*" Again these are fragmentary and symbolic, probably impossible to decipher unless the story is already known.

Experiences: Undoubtedly a big part of life is what we do. Capturing experiences accounted for 26%, with 14% being events and 12% everyday life. Participants concentrated on capturing the mundane: "*the sort of flavour of this particular time, what we did day by day, the things that tend to get missed, forgotten*", "*just what we do today, a snapshot of our kind of life today*." With one exception, the types of events captured are minor ones: cousins visiting for a few days; going to the cinema; receiving spelling awards or performing in a concert. Even a 7th birthday is seen in perspective: "*Photos of the presents A received and a transcription of her saying what they are and who they were from*. […] *In 25 years time you wouldn't have a clue of what your child have got. It could seem quite banal now but I think it will be an interesting cross section because by that time they will be having very different things […] It is a sample of the everyday but it is actually an annual everyday, if that it's not a contradiction."*

The way of capturing daily life (12%) varies from family to family: from a 1-day photo diary, to a one week summary "*C and her boyfriend, T, T and his wife, J, came for dinner to celebrate A's birthday. We had salmon and a chocolate birthday cake*", to a detailed diary for a month "*M. left for America at 4:30am. Howard came to take him to the airport as he always does when it is a drastically early or late flight*", to a 2007 family calendar "*so we can see what everyone was doing, when and with whom*". Other objects represent fragments of everyday life, e.g. a veterinary business card, spelling practice sheet, or school class photo.

Places: Places were also important to participants. Similar to experiences, important places are *familiar*, not exceptional: "*Places where we go a lot. [why?] The places that you know so well become ordinary and we don't have actually any record of it because it is so very familiar*." As a result, the most recorded places are: the home and garden, the local park, the favourite walk, grandparents' place and school. Interestingly, just seeing a little corner of a familiar place provokes endless stories.

Representing today: We expected participants to capture people, experiences and places, but some also attempted to record today's world and society, accounting for 15%. Newspapers and magazines, bills and credit cards, parking permits and train tickets were all collected to capture the present and to feed future reflection: "*I wanted to look back and see what food bills were like and how much it took to fill up my car with petrol*", "*A copy of the Oxford Handbook of Clinical Specialties from 1995. It starts to show signs of dating in the advice it gives so it would be interesting to see in 25 years time how medicine has changed*". These instances are motivated by the expectation that these things will change, allowing one to compare past and present.

[4] A 'Quarrel Buster' is a pupil who is in charge of resolving conflicts rising in the school yard at playtime (recess).

Sometimes participants commented on how their personal life interlinks with the world they live in: "*[this CD] is one of my favourites and the BBC has used many pieces of this album for adverts so there is the associated memory [of popular culture of this time]*".

Communicating with the Future: In the same vein as capturing our current world, 6 participants sealed their thoughts, worries, and hopes to be sent into the future. Thoughts for the future were only 3% of all items but represent a deep emotional involvement. The reasons were different, and included the wish to explain ones' life: "*Perhaps trying to justify our parenting and the way we live and I hope [the children] will have a kind of appreciation for the way we live, more than what they have now*." The desire to capture the children's characters: "*what type of people they are now […] because it would be interesting to know if they have got those personality traits or if life has altered them in some way.*" the wish to record one's deepest hopes: "*what I hope now, personally, for the whole family and for the world too*." the expectations about the future: "*a list of things that I would like to do from now [aged 12] until I open it. I want to see how many of these has happened*." Only 1 young child included something for the future, Fig.4: presents for her children.

"*I have put in presents for when I'm 32 for my children, if I have children. And for my husband."*

[the label read: *'to won of my childrn – love from C'* - misspellings in the original]

Figure 4. Message to the future.

To conclude, as we expected people referred to themselves, their family and to events, but somewhat surprisingly they wanted to record social history as well as to send messages into the future.

Reasons to Store

Lifelogging assumes people's main reason for capturing their life is to *relive* it. Although recording was a predominant reason, we also found other motives: people want to compare today and the future, preserve their past and add a bit of humour. Table 2 shows a summary.

Records, 46%, were simple attempts to capture literal aspects of life: schoolbooks and children's drawings; representing activities like going to school or Brownies, school trips, or climbing.

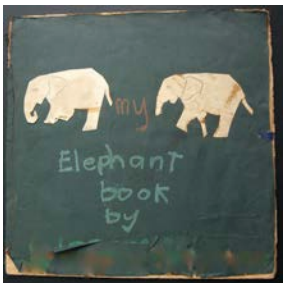
Reminisce: 30% of objects were included to foster rethinking, sometimes with a nostalgic nuance. This includes essays that reflect today, but also predicting the future emotional value of specific objects like father's day cards "*there is a sort of innocence to both the cards that in 25 years time won't be there, probably won't be there in 5 years time*". Objects that foster reminiscing are rarely representative and immediate, tending to be evocative and symbolic "*knife and fork – they represent eating together as a cultural statement* […] *and a lot of our arguing time 'use your knife and fork' that sort of stuff*".

	Record (46%)	Reminisce (30%)	Compare (12%)	Preserve (8%)	Fun (4%)
Photo	63%	21%	5%	9%	2%
Essay	55%	26%	5%	11%	3%
Craftwork	84%	8%	0	8%	0
Ephemera	59%	16%	16%	4%	4%
Things	33%	29%	21%	2%	15%
Video	64%	27%	9%	0	0
Publications	67%	9%	18%	6%	0

Table 2. Types of objects and reasons chosen.

Compare: recording is often done to compare today with tomorrow (12%). Technology is an obvious candidate for such anticipated changes: "*'Miraculous technology': mobile phone, iPod, remote control. We don't know how they will look 25 years from now or if they will still exist*", "*an - already quite old - piece of technology: a mobile phone. We are interested in where technology is going to be in 25 years time. We'll probably think this is extremely old fashioned, but it doesn't feel it.*" Items of comparison have a value not only for the people who selected them, but more generally for today's generation and maybe future ones: "*[the time capsule] is very personal but at the same time it is very much of our era and our time so for anybody in the future whether they have never seen 2008 or whether they remember 2008 it's going to be exciting [to open it]*".

Preserve: The idea of the time capsule engenders the need to preserve: 8% of items were put in purely for preservation. Elements in this class are often unique and the intent is to pass something on from past to future generations. There is a sort of fear that objects could otherwise be lost and preservation is often directed to future generations, see Fig. 5 for one such a case.



"*A little book that I made when I was 5 or 6 about elephants which I thought might be quite nice to share with any other little children… C's children that she is so sure she is going to have…* [see Figure 4] *An old fashioned book made by an old person.*"

Fig 5: An example of preserving an object for the future.

Fun: Somewhat to our surprise, a small group of items was put in for fun (4%). Having a laugh when the time capsule is opened seemed the only motivation: "*this [flower-shaped hanger] fell off L's door 3 times. It will remind me of DIY*[5]

[5] DIY or Do It Yourself is the activity of creating or repairing something without the help of a professional.

failures. It will make me laugh in 25 years time", "*a toilet roll as a symbol of time passing and the fact that we are 'nappy free' now*." The fun is in putting the object in now - as the joke is unlikely to hold 25 years.

How is remembering going to happen?

The implicit assumption in lifelogging is to support *veridical recall*, i.e. the person reliving their life while going through an exhaustive log. However this has been recently called into question by the failure of participants to relate such logs to their lives [28] and their attempts to re-interpret log evidence [14]. Our results echo these criticisms - showing veridical recall is only one of many aspects of autobiographical memories.

As stated before, all objects were classified according to whether they were iconic, symbolic or indexical. Table 3 shows the relation between *type* and *the reason* for the object to be included in the time capsule. A dichotomy emerges. Icons (i.e. objects that directly depict what's signified) are most associated with *recording* today - for looking back - and *comparison*. In contrast, symbols (where the relation between object and signified is indirect or esoteric) connect with *reminisce*, *fun* or *preservation*.

	Icon (48%)	Index (33%)	Symbol (19%)
Record	**63%**	35%	2%
Compare	**56%**	38%	5%
Reminisce	11%	32%	**67%**
Fun	12%	29%	**59%**
Preserve	33%	17%	**50%**

Table 3. Relation between typologies and object functions.

Lifelogging is an unmediated recording activity. By capturing without intervention, lifelogging works at an iconic level. However when interpretation comes into play human intervention is needed. The meaning of indexes could probably be reconstructed by the opener of the time capsule - at least for familiar people or activities represented by the object, e.g. swim suits as reminder of many childhood summers. The symbolic level, in contrast, requires a high degree of human involvement in meaning building (during capture) or interpretation (when accessing). Inferring that a pair of unpaired ballet socks represents the philosophy of the family cannot be directly 'captured' or inferred.

Deep, cryptic meanings that characterise symbols can be communicated only via added narrative or descriptions. We were therefore surprised to find that these were minimal: 7 capsules contained no annotations, 2 had minimal labelling, e.g. "*M is car mad*", and only 1 had exhaustive descriptions, e.g. "*P's favourite things are cups of tea – You don't give Mum any problem until after her first cup of tea in the morning.*" The lack of annotations was surely not the result of casual attitudes to the project, as hours were spent in creating and collecting new material. Neither was it due to the lack of forethought as the probes pushed parents to reflect what they had done 25 years before, thus exposing them to the problems of retrieving from their distant pasts. As with for photo collections [7, 26], participants seemed to believe that because they can remember now, they will be able to do so in the distant future: "*I would like to think that it would be still obvious why we have done it"*. When explicitly questioned about fully understanding what is in the capsule in 25 years time, their first reaction was to suggest they add a list. But on reflection, participants were less troubled, and instead amused by the interpretive challenge: *"part of the fun of opening it would be to try to work it out why or what it was about. So to give some sort of freedom to that instead of saying 'this is in because', instead of giving just one reason."*

Clearly the time capsule is clearly seen not a veridical, exhaustive record, but rather a *set of cues* whose meaning has to be actively reconstructed. Participants did not want a complete record of their past, instead they wanted fine-grained details about a 'typical' day: "*a sample of life, fairly random but described in quite some detail, the detail becomes important.*" Consistent with [31 and 13], our results argue that remembering is an active process based on reconstruction from often fragmentary cues. This suggests new possibilities for the design of digital technology, more oriented towards supporting the creative reconstruction of autobiographical memories, rather than focusing on exhaustive recording, i.e. as in lifelogging.

PRINCIPLES FOR AUTOBIOGRAPHICAL TECHNOLOGY

Active meaning building not passive capture

Two striking properties of the time capsules were an absence of detailed annotations and a focus on highly personal, often specifically constructed, objects. Together these meant that objects were seen as cues for active reconstruction of memories. This has strong implications for the general design of autobiographical tools which therefore need to support active user appropriation, a creative step far beyond the initial passive capture. Thus, instead of recording vast amounts of low-level personal data, we need new applications that allow people to reflect on, and sort through objects related to their pasts. Indeed participants dedicated time and effort in *creating* objects for their time capsule, in the same way that people now make a physical photo album or a CD to celebrate a specific event. Their focus is not on capture but in analysing, reflecting on, and selecting among different materials relating to the past.

New technology should aim to support *active selection*, *creativity* and *meaning building*. These activities could also potentially exploit automatically captured data to enrich recollection [14, 27]. But tools to support the processes of collation, reflection and sorting, have to be *fun,* and we must identify ways to engage people with their digital collections whether these are generated by future lifelogs or current technologies such as digital cameras or videos. The time capsule engendered a high level of engagement around physical objects: e.g. printing from the computer, cutting, as well as gluing, decorating, drawing and writing. Tangible

interaction might therefore be a promising method to motivate people to analyse their digital memorabilia and construct new things. One manifestation might be a "digital bricoleur interactive table" where people can collaboratively manipulate physical and virtual objects. Objects could be created and placed on the surface to retrieve digital content, e.g. a snorkel mask would retrieve photos and video clips from a holiday, along with a travel map and the website of the campsite. Placing scissors, glue and coloured pencils on the table would activate their familiar functions and supports the social creation of the "Summer 2008 – Sailing holiday" augmented scrapbook. Personal comments might be another important creative component: handwriting should not be automatically corrected as small children's spelling mistakes (as in Fig. 4) are an integral and charming part of remembering "life as it was." Finally the table might record the ongoing talk at creation time as this is likely to contain explanations, a critical element in remembering the meaning of symbolic objects. Playback, however, should not be automatic but on request to allow for speculation and reconstruction.

Detect and abstract our habits (then hide them)

We initially expected the time capsules to contain a few emotionally important objects preserved for the future. Instead they often contained mundane elements of everyday life: ephemera that are generally thrown away, as well as recordings of familiar places and activities. But although our participants greatly enjoyed the project, it required considerable commitment: "*I have always wanted to do something like this but never managed to. I am glad you forced me.*" Lifelogging tools might reduce the effort needed to record the mundane by automatically creating *sample summaries* of the everyday. They should abstract data into high-level representations. What people want is not a mass of low level data, but high-level information about familiar habits, places and activities. Next generation lifelogging tools should detect habitual patterns – identifying familiar places and activities, automatically creating maps to be enriched with photos and personal comments. Similarly online booking of theatre shows, grocery shopping, online news or other forms of mundane activities might be automatically *sampled* to grasp the flavour of today's life. The data could be used to pre-populate a digital week's diary, or left lingering on the hard drive to be rediscovered, or automatically redisplayed, years later. This would create a 'digital memory box' allowing casual rediscovery of memorabilia, resembling the emotionally powerful experience of finding long forgotten ephemera in the back of a drawer [8, 29, 25]. However this scenario leaves us with the problem of technology fragility [20]: hardware and software is not expected to last - leading our participants to be emphatically undigital. Without an effort to create self contained and long lasting technology one worry is that the destiny of current digital mementos is to be printed or otherwise to disappear.

Logging the context of life

A second, possibly more important, role for lifelogs might be to provide *contextual information* for the interpretation of more symbolic cues. Few participants provided annotations or explanations as to why certain objects were chosen, in part we argue because they were not focused on the context of retrieval. Lifelogging could provide *context*, e.g. about users' past interactions with an object, allowing them to more easily reconstruct the memories associated with it. Thus instead of lifelogs being *the* critical type of data we record about our pasts, we see them as being important metadata, to allow the interpretation of other more prominent objects. By using sticker-like tags users could collect and organise objects in the same natural way they currently organise photos in albums [15]. The objects could then be returned to their original locations and continue being used. By tracking them we could generate an enhanced time capsule, which not only included the set of objects but also (suitably filtered) relevant contextual information. This additional information could support the users in solving the interpretation 'puzzle'.

And similar principles might be extended to existing digital photo software. Instead of passively storing digital photos, new applications might add history to pictures by tracking which pictures were accessed when and by whom, in what context, and which were edited by which people [7]. Such data, suitably filtered, might serve to animate and contextualise digital photo collections, and make them somewhat more compelling.

CONCLUSIONS

The time capsule was successful in exploring the deliberate capture of mnemonic representations. All participants expended considerable time and effort in construction and believed that they had created collections of significant value. These results suggest important ways to overcome limits in the lifelogging vision. People do not want complete daily records, but rather samples of their everyday habits. They also do not annotate their object collections. A critical role for lifelogging might be to provide metadata for those objects, or sampled abstractions from detailed daily recordings. Our findings also emphasise the importance of active (re)construction rather than passive memory capture. Future technologies need to support active selection and appropriation to allow people to "make their own history".

ACKNOWLEDGMENTS

This study was supported by the EU Memoir grant (MTKD-CT-2005-030008) and the NWO-British Council Partnership Programme in Science (PPS890). We thank all participating families for their enthusiasm and their stories.

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