Chance memories:

Supporting involuntary reminiscence by design

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I declare that this thesis is my own personal effort. Where other sources of information have been used, they have been acknowledged. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.

Jac Fennell, 18th February 2015

Abstract

People give huge importance to preserving their memories as a way of understanding who they are and what they are about. Current memory support systems, however, favour people self-prescribing time and space to collect, store and maintain explicit memory triggers (e.g. photographs, videos, memorabilia). Finding time to access such systems and their potential triggers to engage in reminiscence is a process requiring great effort, organisation and dedication.

This thesis builds on the view that it is not the supports that contain the memory but people to explore new systems that hint at memories rather than serving as repositories. This offers great scope for designers, as systems no longer have to be designed around personal memory evidence alleviating the need for people to contribute, update and retrieve personal content. To achieve this, understanding around involuntary memory provides inspiration towards designing support and is considered through more specific questions:

- What are current methods for capturing, archiving and accessing memory triggers?
- Through understanding the nature of memory, how can design support unexpected remembering?
- How might designed support for unexpected remembering enhance reminiscing experiences?

The methodology is an iterative evaluation of current practices, analysis, proposals and recommendations, with three methods used throughout. First, I review literature around the nature of memory and exploring the current approaches for designing reminiscence support as a foundation for new approaches. Second, I report empirical studies to collect anecdotal evidence of unexpected remembering. Finally, I develop proposals and recommendations that reflect on the findings of the literature review and explorations showing how design can extend and enhance current experiences of unexpected remembering.

Overall, this thesis develops a new approach to designing memory support. As an alternative to prescribing explicit, intense and proactive memory recall instalments, this research presents design recommendations that are sympathetic to how people naturally remember and their need for spontaneous, lightweight memory recall.

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Introduction

This research explores the sporadic and elusive episodes of unexpected remembering important in accessing personal memories, suggesting that these qualities could be enhanced and extended upon in the design of new memory support systems. This introduction explains the intentions and goals for the study, and the approach taken to answer the main research question: how can design support unexpected remembering?

The uncertainty of life promotes moments of unexpected remembering, for example, the simple decision to decorate a room forcing people to come into direct physical contact with their belongings (Garvey, 2001). During unexpected encounters with possessions people decide whether objects begin their transition away from the gaze of everyday life into the safekeeping, out-of-sight realms of the attic, where the probability of encountering it and the memories it evokes will be greatly reduced. Of those objects people decide to keep on display, the physical act of handling encourages reinvigoration, but may also overlay new memories over existing ones. In contrast, some people are unfortunate to experience the involuntary loss of all of their possessions, for example, during a fire or flood, where no longer having certain objects to trigger memories means some memories will never be recovered. Though personal possessions play a role in unexpected remembering, and are the focus for many memory researchers when designing memory support (discussed in greater detail in Chapter 2), there is a plethora of memory triggers that are neither owned nor directed specifically towards people that cause powerful unexpected remembering episodes.

These random encounters with triggers to our memories, met by chance, are able to suddenly link a person to their past, for example, the smell from a dustbin lorry driving past whilst walking triggering sudden remembering of a holiday many years ago. Or the visual perspective of looking into a field through a rusty gate unexpectedly triggers a dormant memory from childhood. These strong examples, taken from design explorations in *Chapter 4*, may seem bizarre and completely random but the impact they have on people and the emotions they trigger can be very powerful.

It is not difficult to think of more examples of involuntary memory, but how can design offer support for this and maintain the delicate balance between spontaneity and overexposure? Designing a telephone to display 'random' images when the phone is in use (images of significant objects, people or places fed to a person whilst in this distracted state) may influence what was talked about or what they did later. A similar type of display framed on the wall could create dinner parties where conversation changes from politics and the weather to reminiscing around shared relationships people have with the images displayed.

As the unpredictable triggering of involuntary memory plays a significant role in daily remembering[1], it is a form of remembering that should be considered and supported by designers in the development of memory support systems. Involuntary remembering offers encounters that are more sympathetic to how people naturally remember (Berntsen, 2009; Mace, 2004), where encouraging serendipitous and unexpected remembering, new technology may be able to go beyond planned memory recall episodes to offer new spaces for imagining and re-creating the past.

Context of research

Current systems designed by memory researchers focus on how technology can support episodes of pro-active, voluntary remembering (for example, Hoven and Eggen, 2003; Stevens et al., 2003; Stevens et al., 2002; Frohlich and Murphy, 2000) and require a kaleidoscope of components to engage in reminiscing: a separate product to access an archive of memory evidence, a pre-recorded collection of potential memory triggers, presence in a certain space where the product is based, attention of one or more people, and time to access the system. If systems require all of these components, it seems likely that reminiscing episodes will be infrequent and ineffective in triggering what Walter Benjamin (Leslie, 1999) calls 'true' memory. Benjamin believed that true memory must always be involuntary, that involuntary memory is spontaneous, subjective and triggered by objects met by chance. Placing the onus on the person to initiate remembering focuses on voluntary attempts to access memories, but overlooks the value of involuntary memory and unexpected encounters with memory triggers. Can the emotive experience of stumbling across childhood toys in unmarked cardboard boxes in the attic be created in other facets of daily life?

[1] On average, people experience 20 - 30 episodes of involuntary remembering a day according to Berntsen (2009).

Of the systems mentioned, all use objects to trigger memories, but objects are only a small part of a vast collection of memory cues. People commonly create and collect objects to remember people, events and experiences, where objects become placeholders to associated memories (Radley, 1990). By creating physical anchors to memories, people strive to preserve a trigger so the memory is not forgotten. Often, objects trigger associated memories through physical encounters with them but there are other ways the same memory may be triggered. Memory cues can include places, tastes, sounds and smells, and an important foundation for this research understands that objects alone do not encapsulate memory triggers. This research considers all memory triggers when exploring how moments of unexpected remembering can be created and extended.

Value of research

There are a number of reasons this research is valuable and timely. The main reason this research contributes significantly to existing work in the area is its focus purely on involuntary memory. Existing research concentrates on voluntary memory, which is only one aspect of memory recall and whilst these systems are valuable in supporting explicit and intense remembering, they miss opportunities to design for impromptu reminiscing and people's need for lightweight memory recall. The value of unexpected remembering episodes can be how they are received spontaneously in euphoric and welcomed ways.

This research also supports people's desire and need to understand, preserve and make-known their presence and individuality. This is seen in the shift towards building evidence of experience, especially online applications making the process easily accessible, for example, 'do-it-yourself' genealogy websites (www.genesreunited.co.uk and www.genealogy.com), and the scrapbooking phenomenon of curating themed personal 'memory books' (Campbell-Slan, 2003). People want to preserve evidence of their memories and are being offered and accepting new ways to do this.

Technological development has also introduced new ways of capturing, creating and storing information around memories through online photo archives and music collections, and social media websites, all supported by widely available and affordable digital equipment capable of capturing and sharing through 'infinite' storage. Through introducing new ways to capture and preserve evidence of memories, new ways to interact with this information are introduced. A good example, and one that embraces the aims of this research is the 'shuffle' feature that was initially introduced to iPod music storage devices, playing back music collections in a different order each time, and stressing the

value of serendipity and unpredictability in discovering music. The iPod was marketed through the benefits of this random play interface with the catchphrase 'enjoy uncertainty'.

I consider how products embracing chance and uncertainty to promote spontaneous and unplanned experiences, moves technology beyond assistive tasks to changing the way people behave and interact with products and systems. With technology's dominant role in supporting the archiving of memory evidence, there seems a trend in people being less supportive of creating non-technology memory evidence archives. Creating physical photo albums and printing photographs were commonplace a few years ago, but the way people keep evidence of memories now has changed with photographs commonly accessed via the digital devices they remain stored on (Sarvas & Frohlich, 2011). With so many technology-assistive methods for archiving information around memories available, finding new ways to experience this information warrants greater exploration and consideration.

Research questions

The main research question is *how can involuntary reminiscence be supported by design?* To answer this general question, there are more specific questions around current and future support for involuntary memory. These are discussed further here and form the thesis chapters. The first specific question deals with understanding the nature of memory and where unexpected remembering resides amongst other aspects of human memory.

What is the current understanding of the nature of memory?

Within this chapter I map current understanding on the nature of memory from how memories form through initial encoding to how they are maintained and, hopefully, revisited in the future. I build discussion around how original memories evolve over time or become lost or distorted by external influences. Specifically, I look to experimental psychology literature to provide information on memory in terms of prospective remembering (Sellen et al., 1997), autobiographical memory (Cohen, 1996; Conway, 1990), involuntary memory (Berntsen, 2009; Mace, 2007), incidental memory (Baine, 1986; Masson & McDaniel, 1976), social remembering (Cohen, 1996) and implicit and explicit memory (Smyth et al., 1994). Aspects of these are discussed with respect to the general memory processes mentioned earlier of building, keeping, visiting, losing and distorting memories.

Within each process, I discuss examples of situations that impact on memory in detail, such as conversation with other people triggering memory recall. These examples show how daily life creates many moments of impromptu remembering. In this sense, the social construction of the way people interact with others is important with time, place and context influencing remembering. Smyth et al. (1994) discuss how the closer the recall situation is to the original event, the more successful the recall, therefore situation and environment is important along with intangible cues like sound, smell and temperature. Similarly, sounds are unique to certain places where the unexpectedness or displacement of a sound can cause a person to question the context and remember the original. Imagine hearing familiarity in a mobile phone's ring-tone: hearing the same music as a TV programme watched as a child, and being subsequently reminded of the forgotten programme once again. In this example, a totally unexpected trigger involuntarily creates a memory recall episode.

Smells and tastes also have this quality of impromptu remembering where their distinctiveness, especially from childhood, can make people suddenly remember the past. Childhood memories are especially interesting as they trigger very intense memories (Smyth et al., 1994; Neisser, 1967), which are heightened because they are the oldest and most forgotten memories. Another reason for this is because fewer material possessions survive from childhood, so the immaterial triggers of smells, tastes and sounds are more likely, for example, the smell of sweets enjoyed as a child. There are many intangible cues to memory recall, and important is distinguishing the types of cues powerful in encouraging spontaneous memories.

Other influences on memories, such as emotions, personality, distinctive events, encountering memory triggers again and the frequency of events, all determine how people keep and access memories. As a result, people have had to develop ways of encouraging the retrieval of memories by creating tangible memory cues, like photos and memorabilia, and adorn domestic spaces with these to encourage future encounters with them. In the next research question I consider the methods people use to capture and preserve evidence of memories, and how designers have developed support for this through the introduction of new devices and systems.

What are the current methods for capturing, archiving and accessing evidence of memories?

To understand more about the triggers to people's memories, and the tangible cues people keep to provide this link, I ask more specific questions around current trends in material

culture are considered. In the second chapter I use the work of material culture scholars, ethnographers and anthropologists to describe the use of material memory triggers in the home (Miller, 2001; Schiffer, 1999; Miller, 1997; Appadurai, 1988; Csikszentmihalyi & Rochberg-Halton, 1981). I also consider public spaces as objects, once memory triggers, frequently occupy the private and public space as they change hands and their commodity value changes from valuable to our memories to their monetary value (Gregson & Crewe, 2003; Appadurai, 1988; Kopytoff, 1988).

How people choose to remember an event is also relevant. The conscious decision to capture evidence of the event and where people choose to keep this influences future memory recall (Edwards, 2001; Marcoux, 2001), and important to this research is the way the movement of objects around the home impacts on impromptu remembering.

I continue this chapter by considering systems and devices introduced by memory researchers to support personal memories. Over the last decade, there has been significant focus from researchers on how aspects of autobiographical memory can be supported. Exploring the wealth of systems introduced indentifies research supporting voluntary memory: pro-active and purposeful accessing of memories. Issues common to these types of voluntary memory recall systems are the need for an archive of material to trigger memories: a database of information supplied and maintained by the owner. The move towards digital capture and life-logging technologies over the past few years (see *Chapter 2: Dealing with Digital)* to store evidence of daily life, brings additional concerns around how useful this information is to future memory recall. Supporting involuntary remembering negates this requirement for systems to purposefully collect and maintain evidence of memories, and in the next research question I find clues for how this can be done.

Through the third research question I consider how people naturally remember and how aspects of current support for remembering is in conflict, to suggest a new approach for supporting personal memories: supporting involuntary reminiscence by design.

Considering the nature of memory, are there clues for how design can develop support for unexpected remembering?

Challenging is the entirely unexpected nature of involuntary memory. If people do not know when they will involuntarily remember something, how can you design for it? Insights into how this could be done became clear after understanding more of the general principles of involuntary memory. These are discussed in greater detail in this chapter.

Involuntary memory has only recently (over the last 15 years) become a distinct discipline in psychology with few key research studies published. Notable work by Berntsen (2009) and Mace (2004) describe the components of involuntary memory and the conditions and situations that promote the triggering of these types of memories. I also use the writings of philosophers such as Proust (1928) and Benjamin (1999) as examples to describe the feelings and emotions involuntary memories often bring.

For more understanding around the subject, I continue the chapter by introducing 'clues' for how designers might support unexpected remembering. These clues begin to show how design proposals might tap into existing situations that exploit characteristics of involuntary memory, for example, designing for suggestion and forgetting. Other practices, such as subliminal cueing, consider messages fed to the subconscious relying on involuntary responses and is a strategy developed further in this chapter too.

These clues are explored through background theories and examples from other design and conceptual art practitioners, as well as through my own proposals that illustrate and conclude each approach. The clues are valuable in showing where unexpected remembering can be found alongside the benefits of producing an initial raft of design concepts focused on unexpected remembering, showing current themes and thinking.

In this chapter, I introduce existing instances of unexpected remembering and begin discussions for how it can be enhanced through design, but these need to be grounded in real-world examples of unexpected remembering that clearly show the power, impact and benefits unexpected remembering brings. I explore these through the fourth research question where I seek evidence of unexpected remembering and look for methods best suited for collecting these.

How can examples of unexpected remembering be documented?

Due to the nature of involuntary memory as just that… involuntary, capturing everyday examples of its elusive serendipitous and random qualities proves difficult. The intention of this research has always been to use examples of unexpected remembering as a resource for understanding involuntary memory (see *Diary Studies* in *'Methodology'* section below) from where recommendations for design are developed. I consider the successful methods of capturing examples of involuntary memories used by psychology researchers (Mace, 2004; Berntsen, 1996) exploring the subject, though for different goals, and tailor them towards my main design exploration: collecting all moments of unexpected remembering from waking to sleeping, from 10 people over the course of one

day. I compare the results to similar studies in the field of psychology before using them as inspiration for a set of design proposals towards the end of the chapter.

Questions I ask during this stage of the research are: When does involuntary remembering occur and are there common triggers as Benjamin (Leslie, 2001) describes, or do they depend more on people's state of mind? By understanding the nature of involuntary memory alongside real-world examples, I conclude this research into a final chapter of design recommendations showcasing how unexpected remembering can be enhanced and extended through design.

How can designers support unexpected remembering?

The design recommendations and interventions I propose show the role design could play in extending and enhancing unexpected remembering. These recommendations test the knowledge gained around involuntary memory and current practices supporting personal memories to suggest new ways unexpected remembering can be triggered, extended and intensified.

I build the design recommendations on the key findings and themes of this research, that personal memories can be, and are often, triggered by information and content that is neither created nor intended for the individual. I show how applying this alongside other conditions and situations ripe for triggering unexpected remembering, can successfully extend current offerings and support. In the final chapter, I introduce four recommendations for how designers can offer this support, each illustrated through design proposals.

Methodology

My approach is grounded in reflective practice, and "the capacity to reflect on action so as to engage in a process of continuous learning" (Schön, 1983). I use my creative practice, through a cycle of linked process stages (*Figure 1*), to explore the edges of existing research and practice, and the gaps within it, where practical explorations offer chance for continuous evaluation and evolution of my research. This process of innovation was developed alongside the requirements of the research to discover the subject and find where designed support might be valued. Each thesis chapter draws on different approaches, so in some the main focus was a literature review with smaller empirical encounters whilst others focussed wholly on collecting evidence with design proposals supporting new insights. This diagram shows how each component influenced and fed into the other, encouraged reflection and determined the focus for the next stage.

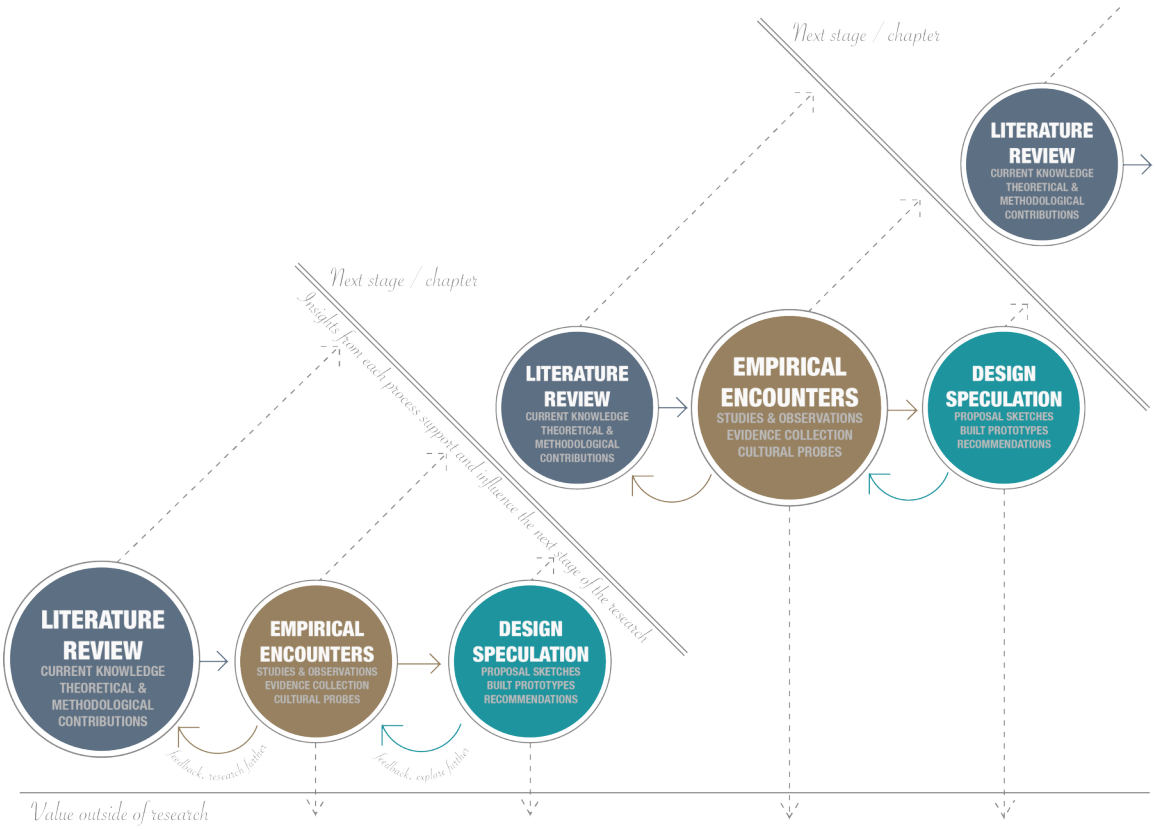

Figure 1: My design process: using reflective practice to cycle through a series of linked stages to explore current themes before moving onto the next stage.

The literature review stage considers current knowledge in the subject and explores the theoretical and methodological contributions made. This allows for reflection upon where to design empirical encounters to explore deeper pockets of insight that might offer new opportunities for designed support. Such empirical encounters might include studies and observations of relevant activities, and evidence and insight collection through cultural probes. The final stage uses design speculation methods to present ideas and findings, and reflect upon where support could lie by presenting design proposals and recommendations.

The advantage of this approach to reflective practice for discovery and innovation can be seen in research by Matthias & Jorgensen (2014), from the Autonomatic group at Falmouth University who embark on a process of reflective practice to discover new approaches in glass investment casting. Through a series of explorations they construct their own theories in order to respond to unfamiliar situations and challenges, and hypothesize on the feedback they gain from practical tests to move the process on, referencing Schön's description of having "a reflective conversation with the situation" (1983). Matthias and Jorgensen remark how limited knowledge of scientific theories may help as innovators as through 'ignorance' they explore many more directions than experts

in the subjects to develop new approaches (2014). Similarly my interest in a subject grounded inherently in theories from psychology, offers new ways of thinking through my explorations and speculations as a design practitioner.

Schön discusses "reflection-in-action as a process we can deliver without being able to say what we are doing" (1987), yet we are able to use this to reflect and shape future action. Throughout the thesis, my design explorations and speculations present this experiential learning and continuous engagement in speculative reflection to develop the information learnt into new knowledge. Kolb & Kolb (2005) remark how practitioners may reflect on experience by gaining general understanding of concepts and testing these on new situations. Similarly through my practice work, I apply knowledge gained from literature reviews and observations to new design explorations and speculations: applying and reapplying, and building on experience to develop my own recommendations.

The role of the artefact in design research

Within this research, the role of the artefact in the design process is important in exploring and opening up the subject. Using artefacts to explore enables researchers to consider new understandings without considering commercial goals to consider other value (Zimmerman et al., 2007), using the creation of artefacts to present possibilities, pose questions and open new spaces for design inquiry (Koskinen et al., 2011).

Critical and speculative design practitioners, to stimulate debate around a subject, often adopt this use of the artefact in design research as a way of allowing people to investigate new offerings (Zimmerman et al., 2010; Zimmerman & Forlizzi, 2008). I use the artefact in my speculative design practice as a way of embodying the current stage of the design process to explore emerging thoughts and themes, and as such, as Fallman (2007) discusses, "takes on a philosophically interesting role as a kind of middle ground between a thought experiment and a real thing." Gaver (2012) remarks on how design artefacts embody many issues and judgements on the part of the designer and indeed, I see the role of the artefact in my research as a tool to present ideas, spark interest in current thinking, and invite reaction and reflection to move the process on to the next stage (whether that be further iteration or the reporting of findings).

Articulating the success of artefacts in my design research might be seen through their value as an evaluation tool, as I use proposals and prototypes throughout to explore the knowledge and insight gained from literature reviews and empirical encounters to offer compelling evidence of how, why and where designers might support chance memories. Here, the artefact becomes a way of articulating thoughts and ideals for opening up and

populating this previously unexplored design space, to encourage people to discuss desires for support by presenting alternatives for accessing our memories.

Whilst commercial design might focus on problem solving by offering solutions, using artefacts in design research for speculation and reflection (through proposals or built prototypes), and often implying less around intended application and use, allows users and designers to consider new desires and realities. In this way, the role of the artefact in my research contributes to a valuable method of inquiry to stimulate debate, address problems and explore new possibilities.

Overall, the theory element of my research informs the practice work of design explorations and proposals, which in turn feeds back into the scholarly work and review of emerging themes. These two elements, theory and practice, are intrinsically linked and concurrent, and not seen as separate pieces of research. Throughout, my methods are similar to the *Grounded Theory Method* advocated by Glaser & Strauss, (1999), where initial evidence and observations collected identifies and informs themes explored during the next stage of the research. As a result, my methods fluctuate between those discussed below as and where relevant, but generally cycle through the following.

Literature review

Firstly, to understand the nature of involuntary memory in order to apply any of its principles further, I review related literature from psychology (Cohen, 1996; Conway, 1990; Salaman, 1982) and philosophy (Benjamin, 1999; Proust, 1928). In addition, other scholarly references to involuntary memory in social anthropology and material culture studies are explored. To understand the influence of material triggers to unexpected remembering, I look to the work of material culture scholars (Edwards, 2001; Miller, 2001; Edwards, 1999; Miller, 1997; Kopytoff, 1988; Csikszentmihalyi & Rochberg-Halton, 1981), and for understanding immaterial memory triggers the work of social anthropologists, most notably Tuan (2001) and Hoskins (1998) are considered.

This review of literature offers understanding around involuntary memory and is used to scope the spaces relevant to this research. I do this in preparation for more specific enquiry in the form of design explorations and proposals, providing solid grounding for my own theories and recommendations for unexpected remembering support.

Current approaches

Secondly, I explore current approaches to memory support through a review of papers by memory researchers (for example, Hoven and Eggen, 2003; Stevens et al., 2003; Stevens et al., 2002; Frohlich and Murphy, 2000). As well as critiquing current support, areas currently unsupported are also highlighted during this process, and I pursue these further through design explorations and speculations. Some of these directly inform my research in the latter stages for example, support for developing technology-driven life-logging systems contradicts how people naturally remember, and by exploring why it is in conflict identifies how people might make use of such a system in the future.

I have identified projects published by Peesapati et al. (2011), Hsieh et al. (2010) and Leong (2009) in the latter stages of my PhD (after the main body of research was completed) show some support for designing for unexpected remembering by offering random meetings with personal memory triggers. The work of Hsieh et al., Peesapati et al. and Leong reach similar conclusions to my own; emphasizing value in serendipitous encounters with personal memories. However, the main difference between their work and my own is the proposed memory trigger.

Developing my own research, it became very apparent how influential and important *impersonal* content is to the way involuntary memories are triggered. Hsieh et al. (2010), Peesapati et al. (2011) and Leong (2009) focus on using *personal* content for triggering memories, with only work by Leong et al. (2010) exploring the influence of other people's photographs on a person's emotion (though in the context of listening to music and reflecting on current mood) touching upon personal reminiscence but not the focus of their study. My research proposes that for design to support involuntary remembering, the trigger to the memory has significant impact on the strong emotions cued. Impersonal content has the power to do this and that is a key finding of this research. Why, becomes evident in the latter chapters of this document, and forms the basis of the design recommendations presented in the final chapter.

Design explorations

Thirdly, to illustrate how common and important involuntary remembering is to people in daily life, I capture instances of involuntary memory through design explorations. I develop a number of empirical encounters during this research exploring themes developing from the literature review and current memory support. These offer valuable insight from speaking to people about their personal memories, where one observes the exchange of memorabilia at the car boot sale to discover stories passed on to new owners.

Another, asks people to record written memories associated with memorabilia in their home, the results of which describe the types of objects people have strong memories associated with.

In the main design exploration, I seek evidence for the main research question: the value of supporting unexpected remembering, using a diary method to record first-hand anecdotal accounts of unexpected remembering during the course of a day, with the recording method capturing details of the memories and the context they are remembered in. I tested the method for its effectiveness by collecting my own involuntary memories, developing it in line with studies by Sellen et al. (1997) who created a participant tool to record remembering to perform an action in the future (prospective memory), and Mace (2004) and Berntsen (1996), who conducted diary studies recording instances of involuntary memory. All found diary studies effective in eliciting quick meaningful responses from people, showing where and when prospective memory (Sellen et al., 1997) and involuntary memory (Mace, 2004; Berntsen, 1996) takes place.

My exploration successfully collects examples of unexpected remembering and identifies common criteria for triggering these types of memories, showing how they can be categorised and determined by their cue. I found these explorations provide information and real-world examples relevant to each chapter, helping to inform the direction of the research at each stage and inspiring the design proposals that feature throughout.

Design speculations and recommendations

Finally, I develop design speculations to reflect upon, and form recommendations and conclusions to each stage of the research. The design explorations are used to build and reflect upon the findings of the literature review, and the design proposals to speculate upon ways of supporting chance memories. My approach builds on speculative design principles (Dunne & Raby, 2013) where design proposals intend to raise awareness, pose questions and provoke discussions around personal memories. Speculative design offers new perspectives on issues by allowing the audience to consider potential conditions that technological and social developments may bring (Droog, 2014).

By presenting speculative design proposals I am able to venture into aspects of unexpected personal reminiscing currently unsupported, and use the concepts to explore new ideas. I use the proposals presented throughout the thesis to visualise my theories and insights developing in each chapter by not offering solutions to issues around unexpected

remembering per se, but stimulating thought and discussion around what might happen with such systems in place.

I use playful proposals to offer new ways to engage with ideas around chance memories, whereby portraying these visually in their proposed setting invites people to imagine and speculate upon their impact. This 'playfulness' is important in my designs as it allows people to explore ways technology can support values such as play, exploration and personal reflection, and reflects Gaver's (2002) discussions on ludic design influenced by Huizinga's theory of play. Huizinga (1950) describes people as innately playful individuals who enjoy engaging in activities not related to utility, duty or truth (Petersen et al., 2009).

Important to consider through these proposals are how experiences around remembering could be extended and enhanced beyond systems and practices currently available; those that go beyond practical support for remembering to find other spaces to encounter moments of remembering experienced with unexpected delight. My proposals promote positive and welcomed experiences (Seligman & Csikszentmihalyi, 2000), based on Desmet & Pohlmeyer's (2013) description of the contribution design can make to the happiness of individuals and their subjective wellbeing. By focussing proposals within a framework of positive design around pleasure, personal significance and virtue, not only promotes subjective wellbeing but also the positive characteristics of involuntary reminiscing I am keen to explore.

Overall, my methodology is an iterative review of current practices, analysis, design exploration, proposals and reflection, with three distinct research areas: understanding memory (specifically the characteristics of unexpected remembering), reflecting upon current support for personal memories, and introducing new recommendations for supporting unexpected remembering through new design explorations and speculations.

In the next section, I set the foundations for this research with initial design explorations and proposals. The following work initiated inquiries into how design could extend support to personal memories and inspired the transition towards developing this as a PhD, hence presenting it here alongside this introduction.

Initial design explorations

Voice-recording teapots and weight-sensing shelves

My journey into this research began with a fascination in the everyday objects people surround themselves with. Embarking on a short (1-year) design project on how people use objects to aid remembering, this section discusses these findings and design speculations that inspired and grounded the PhD. It was through exploring the role of objects in remembering that a clear strand for original research emerged: designing support for involuntary reminiscence.

Though this initial project was carried out previously and does not count towards the PhD, it is important to review it here as it helps set-the-scene. Titled 'multi-sensory memorabilia', the project considered people's definition of memorabilia. Carried out at the Helen Hamlyn Research Centre at the Royal College of Art (October 2002 – October 2003), I worked with research partners Hewlett-Packard who considered rethinking memorabilia for all the senses would improve access to personal memories: moving people towards a multi-sensory view of 'memory triggers.' I explored ways visually impaired people currently save and share personal memories, where the photograph album is inadequate for many. The aim was to introduce new artefacts and processes to aid remembering, which enhance and extend existing practices for visually impaired people with designs inclusive and accessible to all.

The process identified that people's classifications of 'memorabilia' varied, where artefacts provide memory triggers associated with capturing understanding of the self, relationships to other people and past events. The findings showed that when people first consider collecting evidence of memories, visual triggers are most common, with photographs for example, but could the same memories translate into the other senses of sound, touch, smell and taste?

Hewlett-Packard (HP) were keen on breaking away from an image-centric view of keeping photographs and video to remember events by, into a multi-sensory approach towards memory triggers. Their objective was to develop proposals showing access to

personal memories can be improved by rethinking memorabilia for a broader range of senses than just sight. The research aimed to dispel a view of technology being designed for people with disabilities to specifically overcome a disability purely for practical purposes, for example, technology directed towards helping visually impaired people to navigate their environment, cook, eat, read and for education so that they might achieve an 'ordinary' level of independent living. This project pursued using technology for less practical purposes like enhancing quality of life, and builds on the heightened sensory abilities that people with visual impairment often develop.

As primary funding for exploratory work grounded the research in developing new concepts for visually impaired people, I began looking at problems associated with visual impairment around accessing and storing memories. There are two issues to consider: for people who've been blind since birth what other processes support capturing and accessing evidence of memories? And for people who lose sight with age, the most common form of visual impairment, how do people access memories when the triggers created relied on vision; if a person can no longer see a photograph they took, how do they trigger the memory?

Interviews with visually impaired and fully sighted people offered insights into what people class as memorabilia and suggested directions for the project. This stage of the project confirmed fully sighted people favoured collecting visual memorabilia, with a lack of objects as memory triggers in homes for congenitally blind people. Their main method for sharing memories was through their own recollection. One area of great interest was how access to existing memorabilia collections for people experiencing gradual sight loss could be supported. The main themes emerging were:

- There are different types of memorabilia artefacts: those clearly collected for associated memories (such as souvenirs), and those with less-understood associated memories (such as a shell collected from a beach).
- Telling stories about memorabilia has its own narrative: Memorabilia Talk.
- Memories around memorabilia change and update when the memory is triggered.
- How a memory is triggered is often random, unplanned and spontaneous, where there is value in discovering a memorabilia artefact by accident.
- New support for capturing evidence of memories for visually impaired people would be welcomed, for example, a camera for visually impaired people offering alternatives for taking photographs through senses other than sight.
- Memories triggered too often lose their charm as memorabilia.
- Insights gained from each person are strikingly different as to what constitutes memorabilia.

Inspired by the interviews, a sketchbook of concepts that use taste, touch, smell, sound and scale as ways of capturing evidence of memories and triggered subsequent remembering were developed. Mapping these concepts identified the user need they addressed and their potential frequency of use. Using frequency on the matrix supported findings from the interviews that memories triggered too often lose their charm, and indicated the potential success of the concept: this became a factor for choosing which ideas to develop in greater detail as prototypes suitable for user testing. I developed two of these (*Memory China and Memory Shelf*) further focusing each idea specifically on the user scenarios presented alongside. They were presented in an exhibition and symposium at the Royal College of Art (Helen Hamlyn Research Centre, 2003).

The *Memory China* concept is a teapot that records conversations around the dinner table into its lid and plays them back later, into the body of the teapot (*Figure 2*). Inspiration for this design came from the ritual of 'getting out the best china' for a special occasion, where it is those occasions that are memorable.

Figure 2: Memory China prototype

Conversations around the dinner table encapsulate the meaning of 'getting out the best china', allocating quality time to talk with family and friends. One person interviewed discussed his recording of conversations during meals with family and friends, explaining his friends did not like him doing it but were always intrigued when they heard recordings played back months later. It was his way of keeping evidence of that occasion for future remembering.

Working with technical researchers at HP, and with help from Wedgewood supplying the tea set and individually sign-writing the teapot lids, Memory China became a fully working prototype. The teapot captured conversations when the lid was in record mode by means of solid-state audio devices fitted into the lid, and to listen to conversation turning the lid 180 degrees into playback mode would reply the conversations through a speaker in the lid into the body of the teapot. The body of the teapot amplified the sound with amplification varying depending on how much tea had been drunk. Each lid was labelled allowing the owner to identify the events captured.

Another concept prototyped, the *Memory Shelf*, recognised objects through their weight. Inspiration came from extensive work carried out by the Equator group at the Interaction Design Research Studio, Royal College of Art, who considered weight sensor technologies and proposed applications for their use at home (Gaver et al., 2004). Interested in how weight could identify objects rather than through tagging (with RFID for example), the *Memory Shelf* concept developed.

A platform at one end of the shelf weighed objects placed on it (*Figure 3*), where users were able to add audio descriptions through a recording function. When the weight was triggered again in the future, the audio would replay. Initial development of the shelf included an audit of the weight of objects in the home with comparison databases compiled of household objects weighing the same, objects carried by people, objects classed as memorabilia items and those received as presents. Showing the value of using weight to identify objects, these databases highlighted unusual scenarios that might evolve using this means of identification. Of course, researching the weight of household objects also proved the method sometimes inaccurate in identification when objects weigh the same. This inaccuracy provided inspiration for how people might use and misuse the shelf, played out through the scenarios presented alongside the prototype in the exhibition.

The final design had the weighing platform at one end leaving the rest of the shelf for the display of memorabilia items. Placing an artefact on the weighing platform, any audio associated with that weight was played through the speaker on the front of the shelf, with new audio memories added using the record function and microphone.

Figure 3: Memory Shelf prototype

Designed as a working model, the shelf had recording and audio listening capability and the way people interacted with it during the exhibition provided anecdotes for explaining the concept at future events. The impreciseness of identifying objects by weight often triggered the wrong memory but proved just as delightful as reliving the correct memory, if not more so. The unexpectedness of hearing the wrong memory became valuable in developing the research to consider unexpected memories. The interface of the shelf afforded unexpected memory discovery, as for pure memory indulgence people could simply apply pressure with their hand and scroll through all the weights and their associated audio memories.

This project with HP led me to consider how objects might take on a digital existence and influence reminiscing experiences around the home, and became the starting point for an Mphil. HP remained research partners for this and the subsequent transition to PhD, as they were interested in developing new products and services to support the capture of memory evidence beyond photographs.

Primary focus at the start of the Mphil sought deeper understanding around what people class as memorabilia, and how people use these differently to photos. Where

photos are created to capture evidence of an event or experience, memorabilia objects often already exist, like mass-produced objects kept as a link to an event or experience. Photos are generally explicit in visually representing the experience, whereas objects may have more ambiguous and abstract links to associated memories. Memorabilia may be of multiple origins, with multiple interpretations that allow them to be considered differently in terms of how they might be used to cue remembering: a challenge HP were keen to explore. To understand more about memorabilia, I designed an exploration to collect anecdotal evidence of memories people associate with memorabilia.

Memorabilia exploration: Top 20 memorabilia objects

Many factors influence what people keep and why, so to quickly get examples of objects and their owner's associated memories, I gave cameras to people to take photos of objects that trigger memories. Camera kits were given to 25 people at different life stages. The kit asked people to take photographs of objects that trigger personal memories, offering space to write their associated memories on postcards (*Figure 4*). Findings from the camera-kit study showed the types of memories people have associated with objects fit into six groups, which are:

- The special days in their lives
- Achievements they had accomplished (*Figure 5*)
- The first time something happened (*Figures 6 & 8*)
- Objects they had rescued (*Figure 7*)
- Objects that were gifts or had been inherited
- Objects that had multiple stories associated with them

People presented associated memories in two ways: presenting the facts about the origin of the object, or talking about associated memories and their feelings towards the object. I found that people never presented both and used one format throughout their descriptions of their chosen objects, falling into one group or the other.

Many objects photographed were functional tools, used everyday by the household and not found on display. Around half of the objects had associated memories describing the act of rescuing the object, or achievements and endurance where the object represented a feat (*Figure 5*). An unexpected category represented objects with multiple stories attached: either stories the owner wanted to keep secret and private, or other stories told to people which hide the truth.

Figure 4: Camera Kit given out to people (left) and an example of the responses (right).

Other objects were created to aid storytelling episodes, for example one person's story frame of neatly cut and pasted photos where each one represented a special memory. She mentioned on her written postcard the time it took to make, emphasising her dedication to the project by cutting each image into exact 5cm square pieces. She explains how she uses the story frame to aid reminiscing with friends and family visiting her home.

The findings show objects trigger personal memories and serve an important role in storytelling and reminiscing. The memories people associate with an object constantly build and develop from the last time they were remembered, and depend on the current context of remembering. Here, significance and value around an object develops from its commodity value when acquired to biographical significance as memories become associated (Appadurai, 1988; Kopytoff, 1988).

From developing these initial design concepts and explorations, the starting point for this PhD research formed. Exploring themes around memorabilia through these explorations highlighted key issues around how people keep access to memories through their association with tangible memory triggers, and the behaviour people adopt for ensuring they are not forgotten.

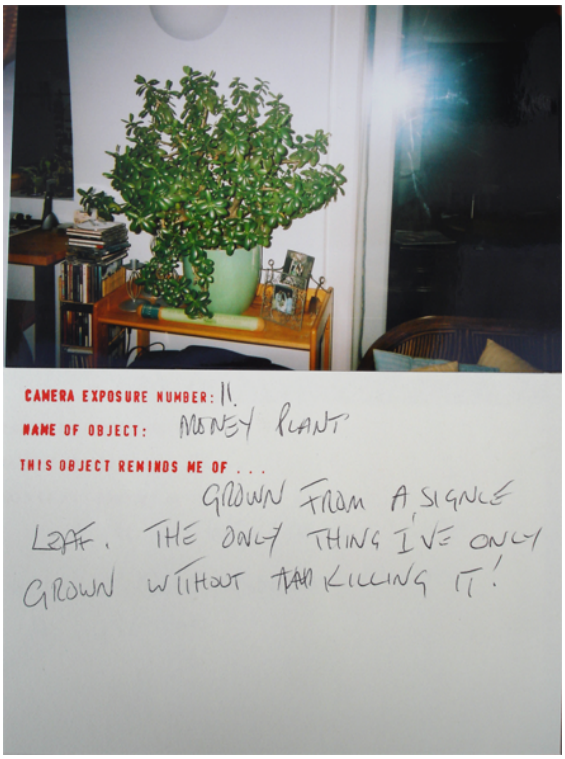

Figure 5:
Money plant, representing 'achievement'

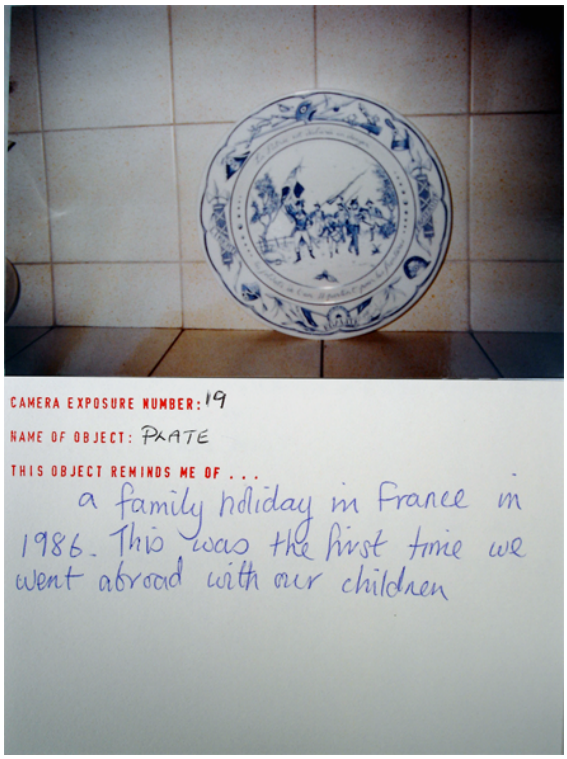

Figure 6:
Plate, representing 'first time'

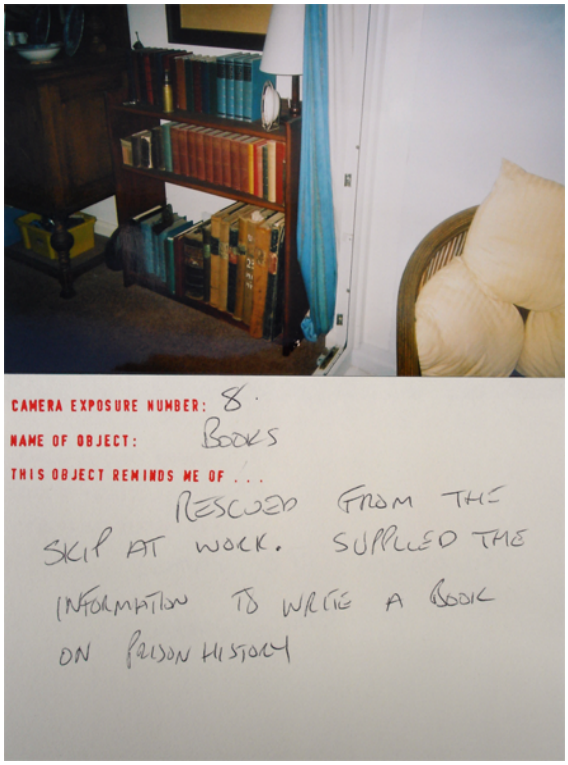

Figure 7:
Books, representing 'rescue'

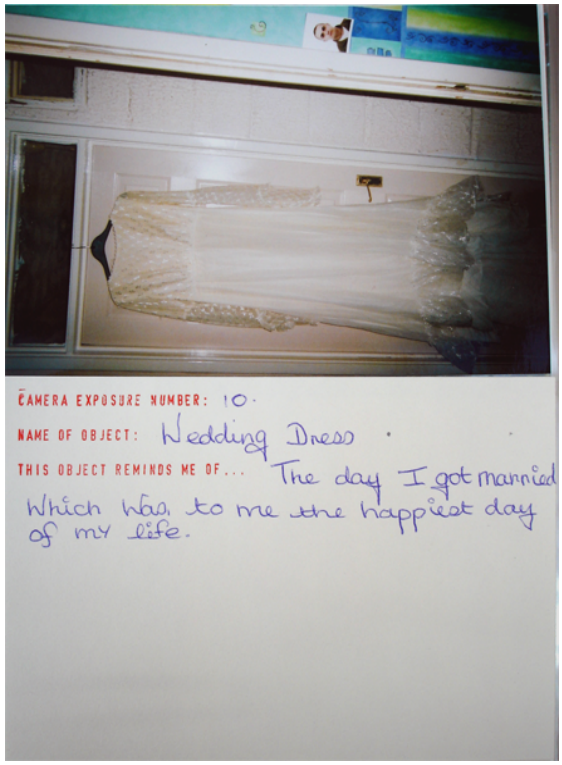

Figure 8:
Wedding dress, representing 'special day'

Themes to take forward

The design explorations demonstrated ways people remember: voluntarily and involuntarily, where voluntarily people pro-actively choose to engage in reminiscing (and is where designers of new systems have focused support) and involuntarily, where memories come to mind unbidden and unexpectedly through no deliberate act of recall. Involuntary remembering occurs many times a day (Berntsen, 2009; Mace, 2007) yet voluntary remembering is supported to a greater extent. It is this arbitrary triggering of memories, both elusive and sporadic, which is just as important in memory recall.

By understanding the characteristics of involuntary memory and designing memory support around these, support may be more sympathetic to how people naturally remember. Through design, new instances of this type of remembering could be created where future work might introduce new objects, products and systems that provide this unexpected link to people's past. People are already aware of, and can relate to instances in everyday life where involuntary memory occurs around chance meetings with memory triggers, and through this PhD, I explore how technology might go beyond specific memory recall episodes to support these chance encounters with our memories and create new spaces for imagining and remembering our past.

CHAPTER 1

The nature of memory

Introduction

Everyone creates stories by which they live by: personal myths designed around what people discover to be true and meaningful in their lives (McAdams, 1997). The stories people create are constructed from many different parts, from experiences that took place, imaginings of what might have happened and beliefs that help them as they try and remember.

The importance of memory: fragility and power

A person's memory plays an important role in understanding their experiences and the way they tell coherent stories about it (Schacter, 1997) with memories being the fragile but extremely powerful results of what people remember from their past, understand about the present and imagine about their future (Abelson, 1981). Memories help to make people individual where we can imagine extremes of what it might be like to lose a limb but still be able to keep our own personhood (Rose, 1998), though losing our memory is not so easy to accept and make sense of. Everyone can remember aspects of their childhood though it was many years ago even though their body substance is continually destroyed and rebuilt. This process makes it more devastating when considering the destructive nature dementia and memory loss, and memory diseases (for example, Alzheimer's), has on a person and their loved ones. On the surface, these personal myths seem fixed and unchanging, formed by the life stages through which people pass, but the stories people tell, the people they encounter and the places they visit all influence and evolve their memories (McAdams, 1997).

People revisit their past frequently during their waking day to accomplish tasks, though not every experience of remembering is done explicitly as identifiable reminiscing. Most daily tasks require people to recall information, for example, the skills and knowledge learnt to write or type, or to drive a car. Accessing these learnt experiences requires the use of *semantic* memory, which holds conceptual and factual knowledge, and *procedural* memory, the skills and habits people learn over time (Schacter, 1997). These

tasks access remembered information but are not episodes referred to as an act of reminiscing. In contrast, people delving into their memories and retrieving and reliving a memorable event is different. This purposeful reminiscing act relies on *episodic* memory, where people recall the events that uniquely define their life.

Tulving (1972) introduced the notion of episodic memory and the opportunity it gives people to mentally time travel (Berntsen, 2009) and re-experience the past, projecting themselves into the future as and when they like (Schacter, 1997). Through combining a person's episodic and semantic memory, their autobiographical memory is constructed where their relationship to the self, their own remembered events and how they use the experience of these together with learnt general knowledge and facts about the world, builds understanding of self (Cohen, 1996).

Though all memory systems are important in their own right, this research focuses on those more relevant to reminiscence and long-term remembering, as shown in *Figure 9*. Therefore, for this study *short-term* and *working* memory, the retention of small amounts of material over periods of a few seconds, and our capacity to "keep things in mind" (Baddeley et al., 2009) when performing complex tasks, is not of great importance. Also, long-term *procedural* memory for skills and tasks has little relevance as it is learnt over time through repetition to perform frequent processes and resides below the level of conscious awareness. Instead, I focus on aspects of *explicit long-term* memory that provide the fundamental theories and understanding of how, why and when people remember the moments in their lives which build and describe their lives, known as *autobiographical* memory.

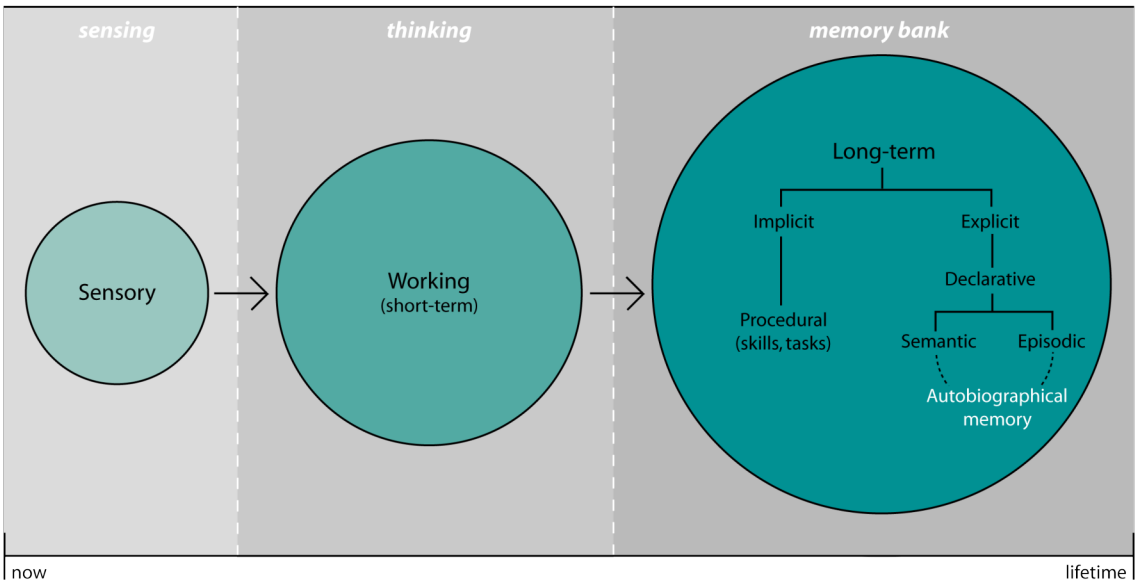

Figure 9: Diagram showing elements of human memory in relation to the focus of this research (autobiographical memory).

Cognitive psychologists now agree on the memory process going through three basic stages and in the past have used a similar analogy to a computer (Baddeley et al., 2009) to describe them: encoding, storage and retrieval. Though much greater processes are at work, to develop an experience into a memory in its simplest sense, a person has to begin by encoding information, developing a capacity to store it, and finally an ability to find and retrieve it at a future date. Each stage determines a different function but they all influence each other: the way the information is encoded has an effect on the way it is stored, and ultimately how the information is then retrieved (Cohen & Conway, 2009). The memory process travels back and forth between these three stages during its lifetime.

To understand further, I now explore the basic ideas around the memory process, for example, how memories are formed, kept and visited, and the issues surrounding each process in relation to the research questions. Throughout, I refer to work from psychology researchers as it is important to explore scientifically how, and under what conditions memories become influenced. Documenting this, although at a fairly basic level, allows future design proposals to be grounded in scientific theory. To explore the nature of memory, I begin with understanding how people's memories are built and formed: the situations providing good conditions for forming new memories and the factors influencing memory storage for potential revisits in the future.

Building Memories

The start of the journey begins with the way information is encoded. The encoding stage, important for future-proofing the memory, processes, organizes and marks information for storage. Without this stage, information would be unable to hold form and disappear; it needs to be given context and a link to other stored information. This form of 'elaboration of information' (Cohen & Conway, 2009) is how people link old and new memories so they offer greater chance of recalling information in the future and experiencing it as a memory. Deconstructing this process, there are internal and external factors influencing memory formation and many memory researchers (Cohen & Conway, 2009; Mace, 2007; Schacter, 1997) have documented these: events personally important, highly emotional, surprising or unique. The vividness of memories can also be related to significant emotions, relevance to personal beliefs and experiences, and the frequency of memory recall and rehearsal (Cohen & Faulkner, 1988), all of which I explore further.

Emotion

People are more likely to remember information if it is encoded following an emotionally charged response like a fear or exhilaration, over everyday stimuli that has little emotional relevance; emotionally over-whelming events are frequently the best-remembered experiences (Williams et al., 2008). Good, but less frequent examples are the vivid memories people create after hearing a shocking public event.

Flashbulb memories are unique in their making, consequent sharing and reminiscing, and a special case of witness memory (Loftus, 2003a; Loftus, 2003b) where people give very personal accounts of what they were doing upon first hearing or experiencing a shocking event. Flashbulb memories become vivid images, frozen in time, of the physical environment and people present at encoding, with a striking characteristic of these memories being long lasting and unchanging over time. The 'live quality' and visual 'print' of the scene of flashbulb memories (Brown & Kulik, 1982) attach fairly unimportant and trivial details to the memories which become important during recall. Also, the emotional impact of experiencing the shocking news ensures the details are rehearsed far more frequently and accurately than other memories (Neisser, 1967).

Personality

The personal relevance of information influences memory formation, with events people can personally relate to and reflect upon more likely to be remembered. Rogers et al. (1977) discuss that people who reference the self when processing information are more likely to remember it than those who do not. Others (Craik & Tulving, 1975) remark on the use of elaboration techniques to perform self-reference processing of information, spending time building connections between new information and that already stored, and processing the information to connect them.

Bartlett (1932) proposed that people structure their memories around their own personal knowledge of the world influencing how new information is stored and subsequently recalled. He describes people using scripts to interpret the world with new information processed depending on how it fits into these. This theory, developed further by cognitive psychologists Schank and Abelson (1977), suggests people organise activities and experiences into scripts with beginnings, middles and ends, and treat each piece of information as part of a category. Outside of that routine, people try to fit it into an existing category in order to give it a place.

As well as emotion, stress and personality internally influencing how people form memories there are also external influences, such as the type of information presented, the situations people are in and frequency of rehearsal. These external influences making information memorable are now discussed in more detail.

Distinctiveness

Information presented in the same way each time is less likely to be encoded than information sent personably in unique and unexpected ways. Known as the *Von Restorff* effect (Wiswede et al., 2006), there are many examples of applying distinctiveness so unusual items within a group stand out and are remembered better than others, for example, highlighting words on a page with a highlighter pen to make them memorable.

People generate their own information in ways unique to a situation, fitting in with their personality and current emotive state so that it aids future remembering. As creator, a person taking a photograph has greater connection to that piece of information as a trigger to remembering the event than any other person present. The photographer chose to capture that moment in time and other people view the event through the photographer's perspective. Known as the *generation* effect (Slamecka & Graf, 1978), people remember information they have generated better than those having information presented to them.

State-dependent learning

Information can be remembered successfully when the contexts and cues are similar at encoding and retrieval (Baddeley et al., 2009). These cues can relate to both the internal and external environment, for example, a person experiencing the same emotional state or finding themselves in the same room an event took place in many years ago. This is also linked to encoding specificity (Tulving & Thomson, 1973) where remembering is often successful if the same information is presented at encoding and retrieval. An example of where encoding specificity is used as a tried and tested method for remembering is when witnesses are brought back to a crime scene to help them remember what happened (Loftus, 2003b).

Rehearsal

Since childhood, people have been told the only sure-fire way to ensure remembering is to keep practicing and repeating information so it 'sticks' and comes to mind quickly and precisely. Though this method is true and well practiced when revising for exams

(voluntarily encoding information to make it memorable), it is a characteristic of autobiographical memories. Well documented by memory researchers (Baddeley et al., 2009; Berntsen, 2009; Cohen & Conway, 2009; Mace, 2007), the more times a memory is remembered and accessed the more likely it is remembered again in the future.

Though rehearsal may seem like memory's eternal saviour, rehearsing the same memory many times has drawbacks; each time it is remembered the primary memory (the closest copy of the original event) takes on new secondary information as new links are made within the context of remembering (Baddeley et al., 2009). It is more likely rehearsed memories are remembered over non-rehearsed memories, but the nature of rehearsal results in the memory being remembered slightly differently each time. Well-rehearsed memories that have seen 30 or more 'outings' can become significantly diluted from the original, and have less impact. By considering how information around the original memory can be preserved alongside each rehearsal, design may be able to support keeping details of the memory true to the original. Also, rehearsing memories bring unique offerings for sharing as memories build and grow into their current offering and help ensure future remembering through shared reminiscence.

Many internal and external factors influence whether a memory becomes so remarkable it is not forgotten. Internal influences, such as highly emotional or stressful situations, and self-referencing between new situations and pre-stored existing knowledge, may not be easily accessible to designers of new systems. However, external influences, such as distinctiveness and encoding specificity may be. Presenting information distinctively at encoding and re-presenting the same context or triggers in the future are recognized ways of encouraging remembering. These, along with frequency and rehearsal are methods designers might consider to support remembering. Having discussed how people encode and make information memorable, I now explore visiting memories and the methods people adopt to ensure memories stay with them.

Visiting Memories

Memory researchers used to consider memories stored as true representations of events with the same memory information accessed each time at recollection, similar to a library with exact copies stored perfectly for future recollection when appropriate cues present (Schacter, 1997). People actually store information differently with an ability to alter and

forget things (Cohen & Conway, 2009; Engel, 2001; Schacter, 1997). People are not conditioned to remember everything the mind processes and have developed methods and systems to help: internally through forming links with memories already formed, and externally through the environment by creating physical cues to trigger memories in the future. As a result, current memory researchers (for example, Engel, 2001; Schacter, 1997 and Conway, 1990) have moved away from describing the memory process as computer-like storage towards a fluid, freeform and evolutionary system.

Damasio (2006) gives a succinct account of complex memory structures and the way people remember, where only the present moment is real and a true representation, as when people remember they create new experiences from old patterns. People's memories are remembered and updated ad hoc by recalling thoughts, plans, imaginings, ideas, fantasies and speculations. Leslie (1999) describes well how people visit their memories.

> "Experience, events, objects are not eternal and ever same, but specific, located. Memory of experience, events and objects is recast in terms of the rememberer's own place of recollection, own desires." (Leslie, 1999, p.113)

One of the most important abilities of a person's memory is forming comprehensible links between the past, present and future (Cohen & Conway, 2009) with memories mapped against current context and reconstructed, if necessary, to ensure safer storage for the future. Cohen (2009) identifies this process develops flexibility and adaptability in the storage of people's memories depending on their goals. This maintenance ability of renewing and adapting to individual surroundings each time a memory is remembered ensures and reaffirms they are a unique and a personal account of life and is highlighted when a number of people experience the same event yet all report different memories of it (Cohen & Conway, 2009).

Creating memory placeholders

In memorable situations, people are adept at creating explicit placeholders, like taking photographs or collecting souvenirs. The desire to encourage future remembering by consciously marking events through memorabilia helps to build and reaffirm connections in people's memories, establishing links to their past and continuing to inform and build their identity (Radley, 1990). However, remembering through certain objects can cause difficulties.

People have a surprisingly poor visual memory for mass-produced objects. This can be seen when asking people to recall details of what is on either side of a ten-pound note. People need to recognise a ten-pound note but not the detail on it (Cohen & Conway, 2009), and though this inability presents as a failure of memory, for design the skill is beneficial in cueing remembering through hints, as a partial clue may be all that is needed to trigger a memory.

People surround themselves with artefacts; chosen and displayed as they either hold purpose, affection or sometimes both (Kwint et al., 1999). When people associate objects with memories, they instinctively display them in prime viewing areas that offer clues to visitors of their past, but for the owner, these displayed objects often 'disappear' into the background and have less impact on triggering remembering. To overcome this stalemate, people actively change their environment to create new stimuli (Bakhurst, 1990). Adding newly framed photographs, decorating rooms or moving home all force people to physically come into contact with their personal possessions where having to decide the future placement of objects inadvertently causes memories to be revisited. This process updates the storage of people's memories both in the physical world through physical triggers, as well as the actual memory through another rehearsal.

Shared remembering

The social nature of people ensures a substantial share of their cognitive processes happen around other people. Maintaining memories through shared remembering and reminiscing is important for preserving, building and describing a personal history. This social function of autobiographical memory, considered one of the most important functions by Neisser (1988), helps people form identity with reminiscing offering the chance for people to decide how they want to be perceived by others.

Regular reminiscing provides a kind of self-maintenance by updating existing memories with new information gained from experiences of sharing with other people: a person's own memory of an event can be influenced by hearing someone else's memory of the same event. Research discusses remembering occurring in social contexts (Bakhurst, 1990) where it aids interpersonal communication (Cohen & Conway, 2009) and the display of memorabilia in the home show family histories formed around the collecting and placement of these physical memory placeholders in groups (Durrant et al., 2009; Taylor et al., 2007; Miller, 2001). Coming across these groups can spark off conversations with family events pieced together by reading clues around their formation.

The way people share and retell memories to encourage future remembering supports views (Edelman, 1990) that memory is not stored as a single piece of content, but with connections to other stored information, reinforced through retelling and sharing with others. It is the events experienced individually, and not subsequently shared and retold, which become difficult to remember, relying on a person's own remembering ability. Difficult because there may be little reason to recall and retell if it has little significance to others, and in those circumstances memories can be often forgotten quickly.

Middleton & Edwards (1990) describes the owner of the memory as a teacher who provides the knowledge, mediates the discussion and contributes information on the unknown facts. They also construct the lesson summaries to recap and make sense of the lesson. The 'teached' then assemble the facts and respond, adding their views and own memories to construct a shared understanding of the memory. Done together, skilled accounts of events and versions are made jointly through persuasion and agreement.

Sharing memories with other people allows them to become dynamic as they enter a state of flux where the organic and uncontrollable growth mechanism that makes them responsive to cues and influences of other people, negotiates and evolves a shared past. These shared memories become new memories for the other person, who in turn may develop and share what they have heard with other people (Engel, 2001). They may credit the origin of the memory or it may lose its originality and become amalgamated into their own memories, as something they have experienced and own.

Storytelling

Memories are often retold using storytelling characteristics through a need to communicate them with expression and structure, offering a rehearsal mechanism that ensues basic historical facts of the memory stay true to the original. People are storytellers and their stories evolve and deepen as they age where McAdams' research (1997) identifies storytelling as integral to personal development and creating personal identity. Combining a person's autobiographical self with their desire to story-tell creates an intrapersonal function (Robinson, 1992) where they construct a self-history. McAdams argues to truly understand a person people need to go beyond the 'objective' data into the stories around their lives. Sharing stories build strong bonds between generations as they transfer a connection from the past to the future, where shared reminiscing builds family relations and ties by linking achievements of the past to the present, preserving family and cultural heritage, and promoting understanding between generations (Hoskins, 1998).

In her study of how objects tell the stories of people's lives in Indonesia, Hoskins (1998) discusses how people and their possessions are so inextricably linked that they cannot not be separated through a single storytelling account around one object. The complex relationships between groups of objects and groups of memories make it difficult to record and deliver an object's associated memory through a single narrative. This has implications for technological devices supporting memories, as they need to support a collection of memories. The nature of memory shows how they can change and evolve depending on the context they are remembered in, with stories told around memories rarely staying the same.

Though the main objective of this research considers extending support for remembering, having considered how people process information to make it memorable, and the tools and methods people adopt to encourage remembering, I now consider how people's memories can fail. Memory is not perfect and people cannot rely on remembering everything. There are reasons people lose access to memories and though it is thought of as being a failing, sometimes it is good to forget.

Losing Memories

The fragility and failings of human memory are creatively explored in literature. In the novel '*One Hundred Years of Solitude*' (Marquez, 1998), the characters battle the uncertainty and fear around forgetting, where author Gabriel Garcia Marquez, through the central character 'Buenda', explores ways to conquer his failing memory by labelling the tools he uses for work as he struggles to remember their names (Schacter, 1997). Labelling helps him so much he shares this experience with everyone in the village by labelling all the objects he finds when villagers show signs of losing their memories, with a fear of forgetting what things were called and what they were for. This culminates in Buenda creating a 'memory machine' to store all written experiences and knowledge of a person's life[2]. Through the authors imagination, systems are adopted that support people's needs and concerns over their naturally failing memories, similar to designers introducing systems to document and explore personal memories. As Schacter (1997) identifies:

[2]A process similar to life-log systems discussed in more detail in *Chapter 2: Implications for Memorabilia*.

> "The novel dramatises a world without memory: a world in which even close friends and family members seem like strangers; a world in which symbolic forms of communication are useless, and most of the tasks on which society depends cannot be performed; and, perhaps most tellingly, a world in which our sense of personal identity and self-awareness is stripped away." (Schacter, 1997, p.2)

Many factors contribute to losing memories but at it's most basic level, a memory is often lost simply because it has not been remembered recently. Frequent and recent remembering of a memory helps to keep it alive by re-linking it to the present and ensuring it is more likely to be remembered again in the future (Engel, 2001). As more time passes, forgotten memories begin to loose specificity by becoming less vivid and accessible, taking on a more generalised 'feeling' of having a memory with less accuracy and ability to recall specific details.

Effects of ageing on remembering

Time becomes memory's prime enemy where the aging process of people highlights this fragility. With age, the retrieval of memories becomes more difficult as people naturally experience a decline in their memory abilities (Small, 2001), though people have learnt to deal with this is through the objects they collect to serve as links to their past (Radley, 1990).

Identified by material cultures researchers (Middleton & Edwards, 1990; Csikszentmihalyi & Rochberg-Halton, 1981), older people choose to keep their possessions more for their mnemonic quality than aesthetics or function. Moving away from their socio-economic life stage, older people strive for triggers to their past through their possessions (Radley, 1990) where this behaviour is emphasized through the making of a will when the importance of possessions are marked through how they wish to be remembered to other people. Alongside age causing a general decline in remembering, there are medical causes too. *Dementia*, an age-related memory disorder, is a medically recognised condition where there is considerable cell death in the brain (Souchay & Moulin, 2007) resulting in loss in ability to recall information. As a result, the most common complaint recorded for people suffering with dementia is memory impairment, with an inability to produce memories.

Ebbinghaus (1885) completed the first study on forgetting and identified lengthening the delay between encoding and retrieval dramatically increases the chance of forgetting. More recently, psychologists Elizabeth and Geoffrey Loftus (1980) updated theories around forgetting where people might forget events temporarily, unable to recall

events at a specific time, but may remember in the future so they are not forgotten permanently only suppressed for later retrieval.

New systems currently proposed by researchers working in this field (see *Chapter 2: Supporting Memorabilia*), offer hopes of recording every detail of people's lives for their supposed benefit (Gemmell et al., 2006; Hodges et al., 2006), though this is in conflict with how people naturally remember. People do not remember everything and to paraphrase Galeano, "Memory is born anew every day"(Loftus, 2003b), with filtered versions created and distorted over time. People's memories are naturally cluttered and unable to produce an exact copy of an original event (Loftus, 2003a), so each time they want to remember they must reconstruct from clutter. Similarly, Bartlett (1932) describes how "remembering is an imaginative reconstruction of past reactions and experiences." Designers considering the characteristics of forgetting for its positive attributes (rather than a weakness of human memory) could use these as a filter to the overwhelming amount of information people process.

The leakiness of memory

The external influence of people, place and time on memory is strong. If people cannot remember something, they often go to friends or family to fill in the missing information (Fivush, 2007), where accuracy is not important more its function and effects on the hearers (Cohen & Conway, 2009). Though remembering through conversation is common, it takes no account of truth or falsity where sharing can imaginatively embellish anecdotes until people can no longer distinguish truth from fiction (Hirst & Echterhoff, 2012).

Over time, the focus on accountability has changed. Gay (1995) remarks how the Victorians celebrated the individual and demanded subjectivity and experience, compared to today where people depend on objective facts that explain the world (Engel, 2001). These accurate accounts are readily available and evident in the design of products and systems that preserve original accounts of personal experience, for example, social media, web-based applications like Nokia's Lifeblog (Nokia, 2008) and technology research projects like Microsoft's Sensecam (Hodges et al., 2006). With abundant data storage capabilities, changing understanding of the past has become less easy as more events are now documented through digital evidence of experience (Loftus and Calvin, 2001). Having identified the vulnerability of people losing memories over time through suggestion or forgetting, there are further questions around modifying and changing memories. I

explore situations and conditions conducive to memory suggestion in the next section by considering memory distortion.

Distorting Memories

People are prone to memories fading when time allows, or being modified through re-telling, and it is in this faded weakened state they become defenceless to misinformation (Loftus, 2001). If people's memories are constantly constructed, reconstructed and occasionally distorted through retelling, might a person's most basic beliefs about their lives and themselves actually be false (Schacter, 1997)?

False memories

Through suggestion and repeated suggestion about an imaginary event, people can create false memories where repeating a false statement over and over can lead people to believe it is true (Engel, 2001). "Social psychologists have documented that when people forget the source of their knowledge, beliefs can be unduly influenced by the statements of people who lack credibility" (Schacter, 1997, p.117), when what a person believes to be true rather than what is true determines how people act in given situations. Memories do not have to be correct but simply feel right to be accepted.

It is almost impossible to distinguish between a real memory and one that is a product of imagination (Loftus, 2001) and the more rehearsals a memory has the more confidence that builds around the memory, encouraging the person to believe what they are remembering to be accurate. This process is heightened when authority figures and credible sources instigate and suggest the false memory (Braun et al., 2002; Loftus, 2003b). Conway (1990) identifies how people can alter and change memories to fit in with their current beliefs and attitudes, where through reconstruction a memory remains unstable and grows.

Loftus (2001) considers people's imagination contributing to false memories as, "Imagination has the power to change what we believe about our past, and what we think we know about ourselves". '*Imagination-inflation*' studies (Hyman & Pentland, 1996; Hyman et al., 1995) suggest imagination combined with other suggestive procedures, like media coverage, can create new autobiographical memories where the memory of an event initially inaccessible can become accessible after prompting. Garry et al. (1996) support this view when they propose the more time between suggesting and recalling the

event the more an imagined memory builds and develops into an event believed to have happened.

Credibility and evidence

Generating evidence builds actuality and truth around people's lives, for example, through collecting photos and souvenirs to authenticate an event, though there are times when evidence overrides personal beliefs as seeing-is-believing and the power of vision can be used to suggest and conclude.

In the current media-rich world, people are constantly confronted with second-hand information reported and received as source material. Newspapers and the emergence of 'infotainment and tabloidization' seen prominently in American and British news (Deuze, 2005) can vary greatly in credibility but as the audience, people believe news reports through saturation and suggestion. People may fail to distinguish reliable sources when information is repeatedly encountered and believed through rehearsal and repetition. This style of reporting shows how easy it can be to introduce rumours: unverified stories circulating about people or events.

In regressive explorations, the power of suggestion can be powerful (Baddeley et al., 2009; Schacter, 1997). During induced mental states of regression, hypnosis leads people into a hypnotic state through a long series of instructions and suggestions, allowing them to delve into past events. Whilst hypnosis does not improve the accuracy of memory retrieval (Schacter, 1997), the hypnotised state makes people more responsive to suggestion and willing to call mental experiences a memory of their own. The hypnotised state offers prime space to suggest and develop rumours to influence a person's memories of their past, and Kirsch (1994) defined hypnosis as a "non-deceptive mega-placebo" where the method openly uses suggestion to amplify its effects.

The malleability and suggestibility of people's memories discussed here show the possibilities of influencing someone's memories, though the extent to which design might adopt such methods to alter and potentially introduce false memories should be questioned. Instead, considering influences that aid suggestion could show ways design can encourage people to explore their memories. I take these ideas, along with other understanding gained throughout this chapter on the nature of memory, and summarise them as a set of themes to take forward to inform future chapters and inspire the supporting practice work (*Design Speculations*).

Conclusion

Many influences, both internal and external, contribute to making situations and experiences memorable; influences like people's emotions, personality traits, distinctiveness, encoding specificity and rehearsal frequency. Keeping memories, however, requires work. Memories fail to remain exact copies of the original and stored forever, instead they are influenced by others and can be lost forever if associated triggers fail to present in the future. As a result, people have developed ways of encouraging memory retrieval by creating cues, like photos and memorabilia, and adorning domestic spaces with these to encourage future memory encounters.

Memories are not black and white, and their very nature of uncertainty and inaccuracy can aid confusion. The mental process of remembering past events not only require people to retrieve, but also construct the memory. Though memories adapt to fit with how they are currently remembered, people have no way of checking their accuracy. Whether remembering is done individually or shared with others, the act of doing so not only renews and revives the memory but also adapts the original. It is the ability of original memories to adapt that highlights its malleable and suggestible characteristic and identifies the situations and conditions that might influence encoding for future recollection. These influences include place of recollection, reminiscing with others, frequency of remembering and so on.

The themes around the nature of memory I have gathered at this stage and take further as inspiration for my design work, include:

Memory is selective

Not everything is remembered. Remembering information depends on relevance of the content and context as to whether it is remembered long-term.

Memory does not need to be complete to be meaningful

People are able to make sense of incomplete information and fill in missing gaps, rationalising based on what they know and feasible speculation. Sometimes, only a hint of a memory is needed to trigger a whole raft of memories, where they become complete and understood through the reminiscing process.

Memory likes similarity

Memories can be triggered more easily and readily when the same cues from encoding are presented again in the future. Also, frequent rehearsal of a memory helps ensure it is not forgotten.

Memory is elaborative

The more meaning people attach at initial capture the more likely they are to remember the information again in the future. Attaching elaborative visuals to information introduces higher-levels of meaning as connections can be made to make it memorable.

Memory is dynamic

Memories constantly change and update depending on who people are with and the context they are in. These external factors can greatly influence information remembered and how it is encoded for future recall.

Memory is highly suggestible

People can be made to believe they have a memory, helped by encouraging them to be creative and imagine they have these memories: the non-event can become an event with the adaptive value of misattribution (Schacter, 1997). People will, however, question situations that do not feel right and use their naturally inquisitive behaviour to make sense of the unfamiliar.

This overview offers examples and clues for designers of the many influences on the memory process and personal memories. How and what people remember depends on many factors and designers of memory support systems could begin to look at any of these as starting points and inspiration for considering how to support remembering. I use the *practice work* for this chapter that follows to look at some of these as approaches, in more detail.

Design speculations

This section pulls together the discussions in this chapter around the *nature of memory* alongside related design explorations and speculations. I use the series of explorations around each memory process (building, visiting, losing and distorting memories) to consider themes around how people currently experience their memories and how design might support this. They create discussion and new approaches to exploring memories and lay the foundations for developing ideas further in the design recommendations later in this research.

To begin, I look at how access to memories evolves alongside a person's desire for keeping memorabilia collections, where life-stage greatly influences this. Though practice work I define the term 'memorabilia,' exploring how the types of memory triggers people

choose influence how people remember. Finally, I consider missing memories by exploring what happens when an object's associated memories are unknown, for example, through inheritance or second-hand retail. All are documented as supportive practice-based research around the nature of memory.

Building memories: Life-stage influences

The encoding stage of the memory process is important for future proofing a memory, where many influences determine information stored as a memory. There are situations conducive to being memorable and important is identifying those as they may benefit from designed support. To do this, I look at the life-stages most people experience during their life, like starting school, moving home, getting married and having children, all of which bring certainty of forming new memories. If designers can use these moments of memory encoding, design could enhance and strongly influence how these memories are stored and remembered in the future.

Reaching life-stages attracts increased memorabilia collection as people mark achievement with tangible evidence (Miller, 2001; Kopytoff, 1988). As young children, collecting and preserving memories is given little thought but as people move away from their childhood home they choose to remember loved ones through small collections of photographs and 'token' objects. Moving into a first home or going away to college, people place more importance on collecting and displaying memorabilia as personal possessions offer a sense of belonging in making a house feel like a home (Miller, 2001). This collecting increases and begins in earnest by accumulating more life-stages, for example, getting married and having a baby, and marking these with photos and mementos. People also preserve evidence of experience for their children's future as well as their own: first shoes, first lock of hair, first tooth, first picture… these memorabilia items becoming more significant as children begin to leave home and leave them behind.

Progressing through life-stages, people move into larger houses where growth in house size is comparable to the size of the accompanying memorabilia collection, though it is only when their own children start collecting memorabilia, when they move out of the family home, that people begin to downsize. Downsizing in house ultimately results in the need to downsize their memorabilia collection, passing cherished items on to loved ones who will continue to care for them, else finding their way to the charity shop or car boot sale in search of a new appreciative owner. Garvey (2001) recognises the process of 'sorting-out' as a framework of 'biography maintenance.' Referencing Giddens, Garvey

notes self-identity achieves coherence through times when people choose to de-archive, allowing active and ongoing revision. This editing of memorabilia happens to a greater extent if people need to move to a retirement home as it forces them to only take their most important and necessary possessions (Radley, 1990).

Ultimately, the end of a person's memorabilia collecting ends when they do, where the writing of a will ensures most cherished possessions are thoughtfully entrusted to a new keeper whilst the majority are left to loved-ones to decide their fate. They may continue their existence and associated memories in the eyes of someone the owner has empowered, begin a new life with a stranger, or become land filled.

Design Speculation

Looking at life-stage and people's desire to collect memorabilia offers clues to where design might provide successful reminiscing support. Design could support the archiving of memory triggers during stages of increased memorabilia collection, and focus on the significant pieces of memorabilia when collections need to become concise and filtered.

Visiting memories: Defining 'memorabilia'

Memories are fluid, dynamic and changing as original memory accounts are reconstructed each time a memory is remembered or retold. People's ability to store, reconstruct and even forget ensures their memories are not stored as exact copies of the original, encouraging people to find ways to help them remember. Earlier in this chapter I discuss how people commonly create and collect explicit placeholders to memories, to prompt future recall, and these take many forms, as documented in the findings from the *Camera-Kit Study* (see *Initial Design Explorations*). The types of objects people choose to talk about as 'memorabilia' vary greatly, and to show the associations between memorabilia and their related memories, I collected examples; from photographs in frames and souvenirs, to museum collections and charity shop finds (*Figure 10*).

The affordances for reminiscing around these objects identified *three* key motivations:

- For objects found predominately in the domestic environment, like photographs in frames, photograph albums, gifts and inherited objects, the motivation for storytelling is for its *personal value*. Associated memories allow people to reflect on their personal association with these objects. These types of storytelling episodes are important to personal development and emotional wellbeing.

Figure 10: Story objects (see text for explanation).

- For objects in the public space, targeted towards groups of people, like reminiscence therapy objects, digital storytelling on TV and museum collections, the motivation for storytelling is for its *historical value*. Storytelling around these objects offer space to remember and share experiences of the past from specific eras, such as collective remembering of growing up at a certain time or in a specific place.

- For objects that enter the public space, aimed at individual members of the public, like charity shop objects, car boot sale objects, antique shop objects and memorabilia TV programmes, the motivation for storytelling often develops around the objects *monetary value*. The purpose of sharing the story develops understanding around the object's monetary worth.

As different types of memorabilia change the motivation for reminiscing and storytelling, identifying where these objects are found and the reminiscing that results, could help designers focus support. Often the focus for designing memory support is to assist with reminiscing around memorabilia found in the domestic space, as triggering memories at home is almost certain. Public spaces also have the potential to trigger memories though key to successful support is finding the links between objects and associated memories when the trigger is not always clear. When they do cue memories though, they are often emotionally powerful due to their unexpectedness, and later in this research (see *Chapter 5*) I look at ways this space can be enhanced through design interventions.

Design Speculation

Collecting and creating memorabilia placeholders to aid associated remembering supports keeping memories accessible. In the past, this support has focussed on domestic spaces but misses the frequent triggering of memories through objects, smells and sounds in public spaces. Designers can support reminiscing further by exploring memory cues in public spaces and introduce proposals that extend this space.

Visiting memories: Second-hand storytelling

Revisited memories develop and evolve when accessed, where the context of revisiting impacts how the information is remembered and encoded again for the future. I explore the influence of other people and places on triggering memories by conducting user observations around the exchange of objects.

Car boot sales offer once cherished objects a second lease of life, with objects arranged on paste tables bidding for the attention of a new owner. Gregson and Crewe (2003) discuss this space where it is not just the goods that receive the attention, but the sellers too as through purchasing, the buyer approves the seller's taste and identity. Charity and retro shops do not have this quality as the disposal of goods is anonymous, but at car boot sales sellers are identified as influential in the exchange in how they appear and act. Storytelling becomes powerful tool in this process as it increases the desirability and credibility of an object when its past is conveyed and passed on to potential buyers, and the car boot sale offers prime space to observe this (also identified by Gregson & Crewe).

Looking specifically at storytelling, issues around authenticity and the construction of stories accompanying objects were observed through a series of field studies over three weeks at a car boot sale. I conducted interviews to record how the memories and stories associated with objects are shared and passed on. Over these visits, I observed the sellers and buyers, and recorded their actions through video. I now summarise the key findings.

One trader constructed different stories around the same object on numerous occasions, each time potential buyers approached. This object (*Figure 11*) is his 'star' that he uses to entice people to his stall, even though he told me he would never sell it. He was very entertaining in his storytelling, and over the weeks I discovered there had been many more versions of this object's history told to other traders. He is known as 'Crocodile Dundee' because of the impressive stories he tells about acquiring the tiger's tooth around his neck. There is no evidence of any truth in these stories, but each time a story is told

Figure 11: Car boot seller 'Crocodile Dundee' enticing potential buyers to his stall with elaborate story-telling around intriguing objects.

more people are encouraged to look at the stall (which I observed), and Gregson & Crewe identified similar behaviour in their study (2003) of the sale of second-hand goods. The motto 'never let the truth get in the way of a good story,' is a successful selling tool for him, as he advertises objects for sale with a compelling tale. At car boot sales, objects and sellers are given more credibility if they have this past that adds value, so if the selling power of an object is in it's marketing and not just its physical attributes, the car boot sale is a prime space for a new type of advertising: personal memory advertising.

Commercial advertising can draw consumers into a brand or lifestyle to the extent of pushing the boundaries of truth, which is why there are regulatory boards in place to monitor false claims. Similarly, this car boot trader pushes these boundaries to make his goods more appealing. This suggests personal memory advertising makes for successful car boot sellers and is an aspect of reminiscing around objects that could be explored further through design. How might aspects of personal memory advertising be encouraged in other spaces, like at home? If objects advertise a storyline from their past, could they spark new reminiscing episodes with family members or visitors to the house?

Speed (2010) discusses the value of stories associated with objects when they exchange in his research on the 'Internet of old things' and the TOTEM project (de Jode et al., 2012; Speed et al., 2012). He explores tactics for including additional information

with objects that authentic their past and provenance, increasing their desirability and appeal to potential new owners when sold in charity shops. Telling stories around objects offers space for elaboration and exaggeration, and storytelling can embrace this for monetary gain. Missing memories around objects at car boot sales rarely affects selling and what seems more important is to have a story that is compelling and grabs the audience's attention. True authenticity is less important as people are able to use the stories for the entertainment value they were imagined for.

Design Speculation

Observations at the car boot sale identify the importance of exchanging memories around objects, not only for keeping memories associated with the object alive but for refreshing our own memories and relationships. Considering car boot sales, objects not personally owned still have the capacity and potential to trigger strong personal memories and this identifies a potential design space; using displays of other people's possessions to encourage and provoke our own personal memories. Though successful triggering of memories cannot be guaranteed with impersonal objects, design may be able to introduce parameters that measure and match likely triggers to our own memories, and I explore these ideas later in this research (see *Chapter 5*).

Losing memories: Unseen photographs

Another aspect to revisiting memories is to consider what happens with *lost* memories. The car boot sale study touches on this as long-forgotten memories may be triggered when similarly once owned objects are rediscovered, resulting in strong emotional recollections. To explore further, I used my own collection of unseen photographs to reflect on this. Inheriting an envelope of old photographs from a relative who had passed away, I was interested in finding new ways to explore the contents. Resisting temptation to look, I took the photos into the Research Studio asking colleagues to find unexpected ways of sending them back to me. These varied from embarrassing flashbacks of a much younger me at home as a teenager displayed for all to see during a weekly seminar, to receiving a photograph through the post to my home address many months later, having subsequently forgotten about the exploration. This last photograph had the greatest impact.

The gift of a photograph of my great aunt and her parents (I believe), sent through the post in a white handwritten envelope amongst a brown sea of household bills, brought great surprise and intrigue. The envelope had no note from whichever colleague had sent

it, and no information to explain the subject of the photograph… just the photograph on its own in an envelope. It took a while to decipher why I had been sent a photograph I did not recognise, but then I remembered the envelope. I knew nothing about where and when the photograph had been taken and had to construct my own understanding. I only just recognised my great aunt as a younger girl but could guess they were her parents from the family resemblance on what appeared to be a family holiday. As well as deconstructing the subject matter, the photo triggered imaginings about her past and growing up, with a sudden strong vivid flashback of visiting her flat in London when I was 8 or 9 years old: an event never previously remembered. As a design exploration, it shows value in exploring new channels for experiencing long-forgotten and even never-before-seen memorabilia.

Design Speculation

Revisiting long-forgotten memories can often trigger rich emotional reminiscing and are generally welcomed positively by people experiencing them (Mace, 2007; Berntsen, 2009). There is value in designers looking for ways to encourage this aspect of remembering, however, with the strong emotions and subsequent flashbacks they may trigger, exploring this needs to be done carefully and sympathetically.

Distorting memories: Inheriting objects

Memories are subject to differing levels of misinformation and distortion. It is common for information to be lost from memory or for wrong information to become associated with original memories, to the extremes of believing completely false memories through suggestion. Looking at situations where memories no longer accompany objects, examples of how people deal with lack of information are found. A good example is with inherited or second-hand objects where associated memories rarely pass on with the object from the previous owner.

During follow-up discussions with people from the *Camera-Kit Study* (see *Initial Design Explorations*), people expressed concern over who might inherit their memorabilia. Pearce (1994) discusses "the collectors desire for immortality through the collection" where people worry about their collection's future, supported by people raising concerns over inheritors not knowing or appreciating memories attached to objects, and that they may be discarded as a result. Pearce identifies the need for 'education' to accompany collections to ensure inheritors understand associated memories. Inheriting an object with little knowledge of associated memories can create intrigue, as in this case (*Figure 12*)

Figure 12: Display cabinet full of inherited objects. All objects inherited by this person were put on display in this cabinet, showing appreciation being entrusted to look after them.

Figure 13: Dog ornament; an inherited object with uncertain knowledge of the previous owners memories associated with the object.

where, during our interview[3], the new owner remarked how all objects left to her were respected and appreciated because of their previous owner's memories even though most of those were now unknown. The new owner felt honoured at being entrusted to look after these ornaments and, as a result, take pride of place on a display cabinet. A dog ornament (*Figure 13*) left to this person triggers no understanding of the previous owner's memories but, when she talks about the object's history, she has pieced together clues from what other family members knew about the object and created her own version. Lack of transfer of information associated with inherited objects is evident through a number of responses from the people interviewed, where some suggested a need to know whilst others liked the air of mystery surrounding them and did not want the emotional 'baggage' of the previous owner.

Design Speculation

Whilst missing information allows people to speculate over the lack of detail, it can lead to inaccurate reminiscing. Designers could explore aspects of this but should do so carefully, offering prompts that encourage people to develop their own enquiries and judgment over missing or distorted information.

This practice work offers initial exploration and design speculation around the vast subject of personal memories and reminiscing. By conducting these short design explorations I have begun to scope the subject, helping to find areas and themes worthy of further study. To understand more around the way people reminisce, I use the next chapter to explore the theories and practices around collecting and creating placeholders and triggers to memories, and how they are currently supported by design.

[3] Transcripts of the interviews can be found in Appendix 1: Memorabilia interviews, where additional understandings of associated memories from other family members are explored alongside display companions and additional storytelling.

CHAPTER 2

Prescriptive remembering

Introduction

> And so it is with our own past. It is a labour in vain to attempt to recapture it: all the efforts of our intellect must prove futile. The past is hidden somewhere outside the realm, beyond the reach of intellect, in some material object (in the sensation which that material object will give us) of which we have no inkling. And it depends on chance whether or not we come upon this object before we ourselves must die. (Proust, 1928, p.50)

People remember through memory triggers, be they physical objects collected at the time, or immaterial triggers like a smell specific to an event. Proust describes people keeping material objects and the author's chance encounters with his own. Without encounters with memory triggers, the fallible nature of biological memory can make access to personal memories difficult. People have always created or collected physical memorabilia, and I use this chapter to look at how memories build and are supported by the material objects Proust describes.

As people support their remembering through creating memory cues, I explore how technology influences this and the new methods people adopt to keep memories accessible. I look at research from *materials cultures* scholars to provide understanding of how, why and where people build collections of memory cues within their lives, gaining a basic rationale of how the placement of these triggers influence memory recall, and identifying the spaces that enhance and extend reminiscing experiences. I go on to research the approaches taken by memory researchers to support remembering, critiquing and assessing how current support aids remembering and its impact.

Finally, I consider how new advances in technology change the way people create evidence of their memories. The wide adoption of mobile devices with integrated software support for remote sharing has created a shift towards ad hoc, in the moment documenting of experiences (Java et al., 2007; Nardi et al., 2004) and key considerations are how this supports our memories. Domestication theory (Berker et al., 2006; Pantzar, 1997) provides understanding around how technology innovations are appropriated by users and integrated and adapted into daily practices to aid collection of memory evidence. These explorations will guide my design proposals developed later in this research.

Creating memorabilia

Objects surround people where people interact not with other people as such, but with objects and people compounded with objects (Schiffer, 1999). Objects influence and initiate human communication and behaviour, as when people interact with others, anything they do communicates: behaviour is communication and communication is behaviour. In respect of this, virtually all communication and human behaviour involves objects resulting in people attaching meaning and association through their own experiences and memories. This way of remembering with objects has been a way of preserving memories for a long time; from crafting mnemonic devices (Mack, 2003), building commemorative memorials (King, 1999; Rowlands, 1999), burying possessions with the dead (Forty & Küchler, 2001) and the everyday preservation of objects to cue memories at home (Miller, 2001; Pearce, 1994).

The objects people choose to mark events by relate to the memories people associate with them. The conscious decision of capturing evidence of an event through a physical object that has the potential to cue remembering, and where people choose to keep this evidence, determines memory recall in the future (Edwards, 2001) and the history that builds around it. Material cultures researchers explore life histories developing around objects and important to this research is the influence of this process on personal remembering.

Object memory lifecycle

Referring to Schiffer and Skibo (1997), the life history is the sequence of interactions and activities that occurs during its existence. Object life histories are constructed sets of activities, where each comprises of a set of interactions. With people's life histories being long and complicated, consisting of many activities and interactions marking significant change in a person's life, the result are memories around objects varying over time; varying in significance to the owner as the owner goes through their own life stages (Csikszentmihalyi & Rochberg-Halton, 1981).

The evidence of memories people attach to objects reside as 'facts' the object can be remembered around (*Figure 14*), where future interactions contribute to the life history of the object with additional memory information being like an actor in a story waiting to be told. There is not just one scripted story that accompanies an object but a series of stories

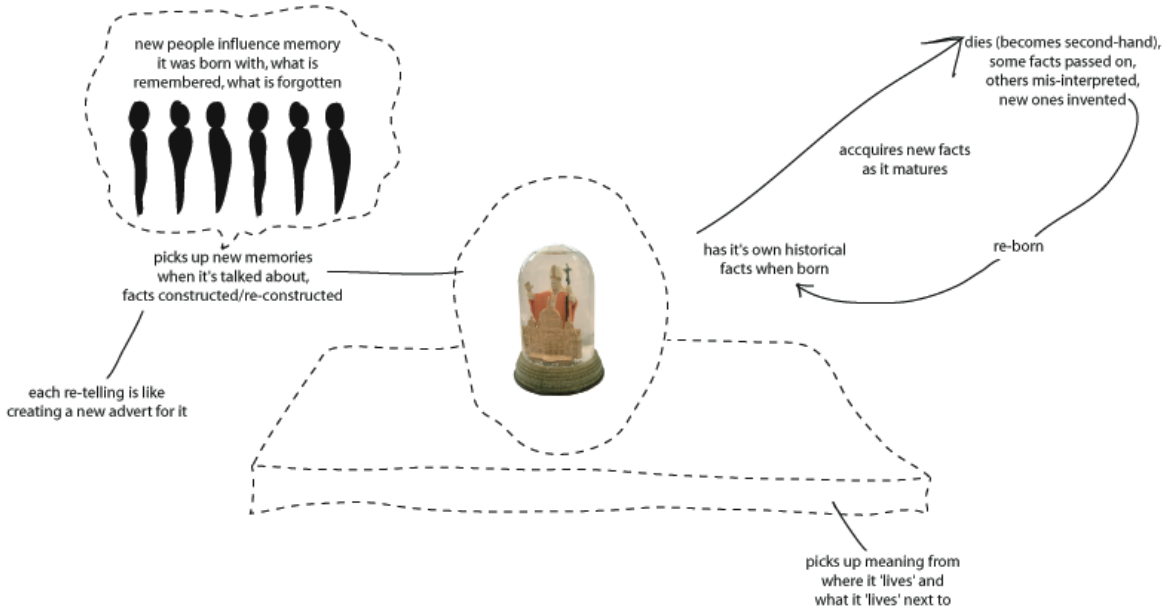

Figure 1: Object memory lifecycle, illustrating how memories become associated with objects.

which change and develop each time associated memories are accessed depending on the context they are remembered in, who they are with, and where.

Frohlich et al. (2002) investigates the use of printed and digital photos in the home where they found the retelling of stories changes depending on context. Each retelling creates an 'outing' (Frohlich, 2004) where the memory is edited and expanded upon depending on the context, collecting comments from people when shared and, in turn, influencing how it is remembered in the future. I compare this process to media advertising where a brand's message or slogan stays the same but seasonal celebrity endorsements refresh the brand to encourage the consumer to remember the product. With memorabilia, the object will ultimately reach a stage where its associated memories could be lost forever, when the owner no longer has possession of the object, and at this point, some memories may pass on and stay or the process will be repeated and begin a new life cycle.

The retelling of memories influences how information becomes associated with objects, where a storyteller will act as an editor to an object's associated biography and authenticity. Add to this the imprecise nature of human memory (see *Chapter 1: Losing Memories*) and over time people may remember associated memories differently, or even forget them. With storytelling, the more the story is told the more concise it will become, telling the story around key facts (Garvey, 2001) with forgotten information potentially constructed by people into their own fantasy of how they wish to remember an event (see

Figure 11: Display cabinet of inherited objects). During storytelling, objects may become 'props' where the more objects there are, the greater influence they have on how the story is told. With only one object the story might become animated, allowing the storyteller to deviate from the truth to fill in the visual gaps as there is little to physically anchor the story. This allows the storyteller to improvise (Sabnani, 2005) and potentially change aspects depending on the audience's reaction (*Figure 15*). The more objects present, the more difficult it is to take different paths along the narration (Garvey, 2001) using objects to literally illustrate the story.

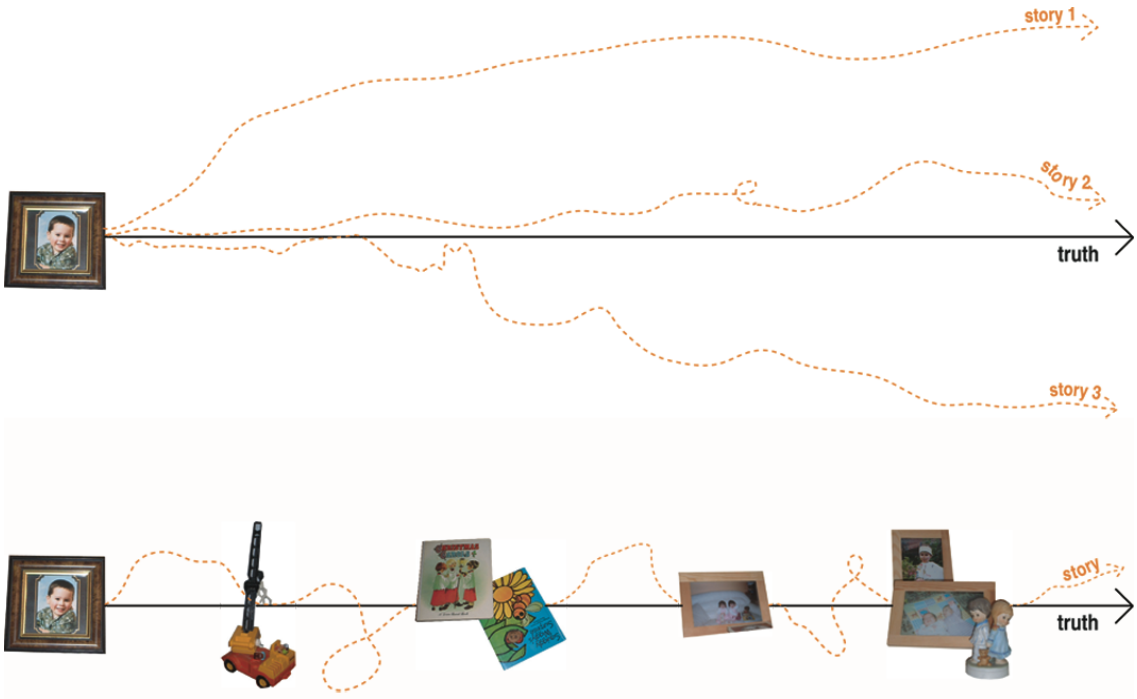

Figure 2: Story paths, showing how authenticity in storytelling evolves and develops differently between objects and groups of objects.

Considering this in respect to memorabilia in the domestic space and reminiscing conversations cued around them, different objects and media impose different reminiscing constraints. Photographs are collected explicitly (Frohlich, 2004) whereas souvenirs (Edwards, 1999) and other objects (Higgins, 2003) gather implicit meaning, for example, an unexpected memorabilia object that gains 'memorabilia' status through its association with a personal memory. Photos may visually 'show' the experience whereas objects might be more abstract; the least expressive but potentially most evocative when compared to photographs (Stevens et al., 2005). In-between, souvenirs direct reminiscence towards places visited offering hints towards the associated memories.

Leslie (1999) remarks how the souvenir packages up an experience as contained and inaccessible, significant only to the individual, whereas Pearce (1994) succinctly describes them as samples of events that can be remembered but not relived as the events aren't repeatable but are reportable. In this role, the souvenir acts as a servant, to authenticate the narrative in which the owner talks about the event.

Gaining memorabilia status

When objects mean something they are interpreted in the context of past experiences, either consciously or unconsciously, in the form of habit (Csikszentmihalyi and Rochberg-Halton, 1981). To talk of meaning attached to objects highlights their potential value to other people (Appadurai, 1988), value given through the transactions, attributions and motivations as they come into contact with them. The emotions objects trigger reflects a person's attitude as people can make certain things mean something; evident when people organise their environment and direct the display of objects to reveal their own past as well as their present goals.

Csikszentmihalyi and Rochberg-Halton (1981) discuss how "the objects that people use, despite their incredible diversity and sometimes contradictory usage, appear to be signs on a blueprint that represent the relation of man to himself, to his fellows, and to the universe" (p.38). They state, "objects, then, serve to express dynamic processes within people, among people, and between people and the total environment" (p.43). In Forty and Küchler's introduction to The Art of Forgetting (2001), Western society is discussed as traditionally assuming that objects act as "analogues of human memory" (p.2), and in so doing, preserve the memory through the durability of the object, creating placeholders for future remembering.

Csikszentmihalyi and Rochberg-Halton (1981) note the work of John Dewey who introduces the distinction between perception and recognition as a method of understanding the role of an object's own qualities:

> Recognition is when we experience a thing and interpret it only as something we already know… It does not produce a new organisation of feeling, attention or intentions. Many people relate to objects through recognition simply because of habituation, or because they are unable to give their full attention to all the information received from the environment. (Csikszentmihalyi & Rochberg-Halton, 1981, p.44)

They go on to describe how repetitive recognition changes our perception of the object where "the nth listening to a favourite piece of music, the re-viewing of a painting or a sunset – or any activity – can and should involve novel elements that make the experience unique and complete" (p.177).

The role of the photograph

The introduction of photography was seen to provide truthfulness and an accurate depiction of reality (Gunning, 2004). Photographs offer a way of capturing a physical reminder of a person's experience though the exacting snapshot they capture where the permanence of the photo can cause problems in accessing the actual memory. By cueing memory through photographs, what is seen in the picture influences what is remembered rather than the memories they represent. The photograph, in essence, becomes what causes the memory to be forgotten rather than its initial aim: to serve as a physical reminder of the memory.

The influence photographs have over original memories, and their ability to create almost 'false' (see *Chapter 1: Distorted Memories*) memories show how photographs, though commonly used to preserve and serve as triggers to people's memories, may actually reside in conflict with original memories. Despite this, photography has developed over the years to become the most popular way of capturing evidence of memories. Prior to digital photography, photography companies developed marketing strategies around the significant benefits it brought supporting memories, something people had battled with and which no other product could support. Kodak, one of the first companies to sell photographic film, promoted photographs on the basis that it 'preserved memory'.

> George Eastman, the founder of Kodak, summed up the company's enormously successful marketing strategy in a few words: 'Kodak doesn't sell film, it sells memories.' In doing so, he acknowledged the strong link in the public perception between photography and memory. (Ingenious, 2011b)

Photographic advertising emphasised the capturing of evidence of experiences and preserving the family memory archive, where the photograph offers opportunity to share and take part in social relationships and collective remembering. To understand this value of sharing photographs, Edwards (1999) states:

> One of the most widespread functions of photographs as material objects is as objects of exchange. While the image itself is, of course, central to the act, giving, receiving and utilizing the material object is integral to the social meaning of those images. Photographs operating as exchange objects and circulate as *memory texts*. (Edwards, 1999, p.232)

Though, over the years the photograph changed from being a leisure tool for capturing the present to preserving cues to memories, another recent change is evident. Mobile devices with integrated cameras and the ease of communication through sharing software offers opportunities to document life-on-the-go, instantaneously and spontaneously. I discuss

how people consume digital photos in more detail later in this chapter in relation to its affect on accessing and sharing memories (see *Chapter 2: Dealing with Digital*).

Using memorabilia

As people play an active role in future-proofing access to memories by creating memory placeholders, most of this physical evidence occupies the personal domestic space, where display and storage areas of the home house these triggers to remembering the past and hope of what is yet to come.

The home as display

The display of personal possessions makes a house a home (Miller, 2001) offering reference points to the events and memories of the past. Personal possessions provide concreteness and permanence to memory that Csikszentmihalyi and Rochberg-Halton (1981) identify as having a 'peculiar character of objectivity', provoking similar reflections from the same people during their lifetime.

Exploring the importance and architecture of place highlights instances where the movement of objects around the home triggers memories. Research on the meaning of place (Tuan, 2001) and people's behaviour for object accumulation, shows how the interaction of people with each other and these objects turns the space into a place (Dant, 1999). Through object placement people assign value to a space, acquiring meaning by accruing sentiment from the owner and visually making a house homely. Tuan (2001) discusses home as the 'centre of the world,' a personal 'cosmos' constructed by people and the focal point in their life where the consequences of losing this centre seems destructive even though people have the ability to build again. As this centre is not fixed in location, when people move so does the centre. Here, it is not the location that is important in terms of its space and geography but the location in terms of its place and the personal objects that occupy.

Marcoux (2001) discusses how moving home forces memories to be updated as people come into contact with their possessions and cue memories through packing and taking them to the new home. People will assign more value to these objects through the moving process as deciding to dispose (termed 'de-archiving' by Miller, 2001) of an object gives more value to the objects kept. As Marcoux states "Sorting out is to engage oneself in an excavation of the memory. It requires us to go into details, to the heart of things for

one cannot content oneself with an overview" (p.78). This process of people throwing possessions away in order to remember other objects better, Marcoux describes as '*a refurbishment of memory*.'

The way people construct their personal landscape when rebuilding their home represents a display of themselves to family and friends (Miller, 2001; Pearce, 1994; Csikszentmihalyi & Rochberg-Halton, 1981) as people react to objects and trigger associated memories based on where they are placed. A person's decision to place an ornament on a shelf in the living room or in a box in the attic determines how often it is seen. The everyday sight of an object on display can make triggering associated memories likely, but they may be less powerful compared to the infrequent re-discovery of the object in the attic. Keeping cherished items away from everyday gaze promotes less frequent and potentially more intense reminiscing, as moments of reflection depend on chance encounters; perhaps discovered by accident whilst searching for Christmas decorations in the attic, or when a house move forces physical contact. Many objects stored away are often forgotten, but storing objects within the home also shows the possessive hold certain objects have on a person.

Interacting with an object at the place it resides provides context to the piece in terms of how the owner wishes the object to be understood, for example, shared conversation in public display areas, versus private reflection in storage areas. The current systems designed to support remembering suggest moving objects away from where they reside (Hoven & Eggen, 2003; Stevens et al., 2003; Stevens et al., 2002), or creating a new home (Frohlich & Murphy, 2000) to cue associated information, but the powerful impact location has on remembering suggests content offered in situ is more sympathetic to how memories are naturally triggered.

To further understand how the location of objects in the home influences remembering, the architectural change of this space needs consideration. Restricted space from city living has influenced the keeping of memorabilia. Needing more living space, once valuable store spaces, such as the attic, are now being converted where this increase in loft conversions is evident in television programmes shifting from how to decorate homes to how to 'de-junk' and make money from clutter. Less storage at home forces people to look elsewhere for space to store prized possessions, such as large warehouse-style self-storage units, offering new places for memorabilia and becoming the new extensions people are 'building' for their homes. As possessions shift to out-of-town storage facilities to make use of every inch of domestic living space, how can the key values of the home attic be translated? How can we experience the serendipitous quality

of stumbling across old childhood toys in unmarked cardboard boxes if these spaces no longer exist? Objects in the attic are kept in a suspended time and space away from consumption and their lack of order invites memory to rearrange (Stewart, 1993), so by losing these spaces are we losing valuable reminiscing experiences?

Memorabilia topography

The process of re-organising objects within the home has been described by Garvey (2001) as a framework for developing personal stories chosen and maintained by the self, and how people orchestrate encounters with these through placement is important to these reminiscing episodes. Topographically mapping sets of objects in the landscape (González, 1995), as done commonly by archaeologists (Pearce, 1994), offers more information that can be inferred about the object.

In the home, objects are often arranged into 'corners of reminiscences' (Hecht, 2001) with prized possessions and important pieces arranged as small collections grouped together under themes: historical, aesthetic, social, functional. This 'arranging' is a good indication of the value owners attach to these possessions, where Edwards (1999) talks about the role of the 'family archivist' as a person who is dedicated to controlling the space between history and fantasy, and the spaces within the home that serve this function:

> Such spaces, as shrines, become public statements of group achievement and assurance; private statements of devotion, past and present, spaces where public and private memory and evocation overlap. (Edwards, 1999, p.234)

These objects are a still life, displaying organisation of the material world with a hidden history (Stewart, 1993) where nothing changes until the narrative is spoken to understand the grouping[4].

Losing possessions

Understanding how objects provide physical markers to the past illustrates how losing a home would destroy a private museum of memory and identity (Hecht, 2001). The emotional trauma of losing all possessions in a house fire results in an inability to trigger past events and memories in the future through personal possessions, where in such cases, people would need to fall back on the unreliable nature of memory (Loftus & Calvin, 2001) to remember. There must be great fear that the leakiness of memory (see *Chapter 1:*

[4] See group categorization results of the Camera-kit Study, Initial Design Explorations.

Losing Memories) results in some events never being remembered, but perhaps also a cathartic feeling in a burden being lifted and an empty space to begin again. A number of art projects explored this notion of losing possessions, emphasising the emotional attachment people have to them, for example, Freyer's '*All my Life for Sale*' (2002) and Landy's '*Breakdown*' (Stallabrass & Landy, 2001).

'All my life for sale' listed all objects owned by the artist, Freyer, on the Internet auction site *eBay* with the intention of selling all the artist's possessions (*Figure 16*). The aim was to explore relationships with the objects people surround themselves with, and form ideas around what builds identity.

Over the course of the project Freyer sold almost everything, posting each item to their new owner along with details about the project and a history of the object purchased. He then requested updates from the new owners of his possessions in their new homes, before embarking on a journey to visit his former possession's new homes and documenting their surroundings (Freyer, 2005).

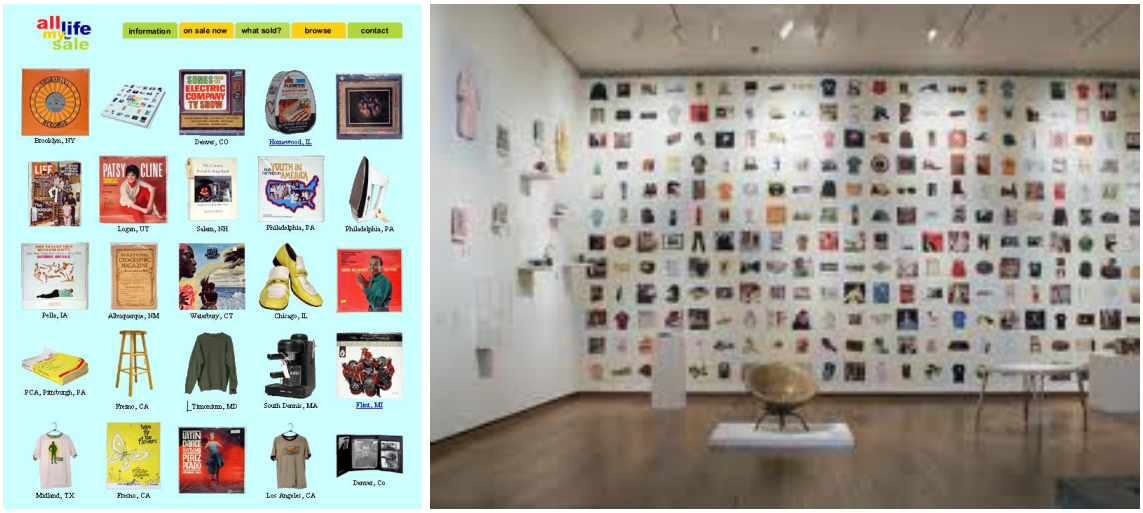

Figure 3: All my life for sale, by John Freyer (2005). Freyer decided to sell all of his possessions on the Internet, and proceeded to document and visit his onetime possessions in their new homes.

Landy's '*Breakdown*' installation shredded everything he owned over a two-week period. His reasons for doing so were comments on society's 'romance with consumerism', the amount of raw material going into making objects, the lifespan of objects, and the relationship people have with their possessions (*Figure 17*). Landy made an inventory of all of his possessions to be destroyed with details loaded onto a database. Each item was then placed onto a conveyor belt where 10 assistants began destroying them. At the end of the project Landy commented that the apt title described the personal break down that would now commence as he began a life without his self-defining belongings.

Figure 4: Breakdown, by Michael Landy (Stallabrass & Landy, 2001). Landy made an inventory of everything he owned then set about destroying it publically, piece by piece.

Projects like *Breakdown* and *All My Life for Sale* identify how important possessions are to people in defining their history and identity, providing them with a self-maintenance function as they prompt people to remember their past. Without possessions to form triggers to memories, people may lose some of their memories forever.

Supporting memorabilia

People rely on building their own system of capturing, archiving and encountering memorabilia objects, and researchers have developed a wealth of systems that, through technology, aim to offer memory support. I reflect upon the support these systems offer in respect to the nature of memory (*Chapter 1*) and the practice of collecting evidence of memories.

Augmented memorabilia

Previously, the use of technology to support personal memories focused on capturing evidence of experiences through photographs, but now systems have been designed that propose ways to connect different types of associated content from a variety of media (like digital photos, videos, annotation, music and objects). Offering spaces to review

collections of associated memorabilia through oral recordings, such as the *Memory Box* (Frohlich & Murphy, 2000), visual media, such as the *Digital Photo Browser* (Hoven, 2004; Hoven & Eggen, 2003) or both, such as the *Living Memory Box* (Stevens et al., 2003; Stevens et al., 2002), these systems (and others similar) and their support for remembering are now discussed on individual merit.

Memory Box (Frohlich & Murphy, 2000) assists audio playback of pre-recorded narration through souvenirs. Designed as a small box that houses souvenirs the system allows people to record audio and link them to objects (*Figure 18*), where removing an object cues its associated audio playback. The *Memory Box* benefits from being self-contained and portable though only offers limited recording and focuses purely on objects being used explicitly to cue a memory rather than taking into account the reconstructive nature of reminiscing around memories.

Figure 18: Memory Box, by Frohlich & Murphy (2000), explores the potential of recording and attaching stories to physical memorabilia kept in a box.

Similarly, *Every Object Tells a Story* (Holmquist et al., 2000) uses physical artefacts to enhance storytelling, allowing users to manipulate and interact with physical objects to access additional content. The project considers attaching objects with potentially ubiquitous 'memory chips', like RFID tags, that can trigger additional digitally stored

multimedia content to enhance storytelling and reminiscing. The attraction of these interfaces is the central role the original artefacts have in the retelling of the story.

Living Memory Box (Stevens et al., 2003 & 2002) is "an archival and narration device, allowing families to both bring together artefacts and tell stories about those particular items". The system consists of a central device that accommodates the objects, a recording device (camera, microphone etc.) and a network connection.

An image taken of the object placed in the box is used to identify the object to the system in the future, and with the digitised representation, metadata can be added, such as audio stories, names and related images, over the network to create an archive of associated memory information linked with each object and accessed through the screen. The *Living Memory Box* is limited by its fixed location and simply supports the recording and tagging of factual information to create databases around objects; less focus is given to the stories and remembering around these objects.

Supporting this approach, other researchers suggest combining parallel stores of associated information: the physical memorabilia people keep in their homes and the associated digital online content of photos, music and more. Petrelli et al. (2008) consider people's use of memory triggers, be they physical artefacts or digital photos, finding a need to link them together with appropriate technological support during reminiscing episodes. They suggest suitable support could be offered by digitally enhancing physical memorabilia. This has already been explored in systems like the *Digital Photo Browser* (Hoven and Eggen, 2003), in *Figure 19*.

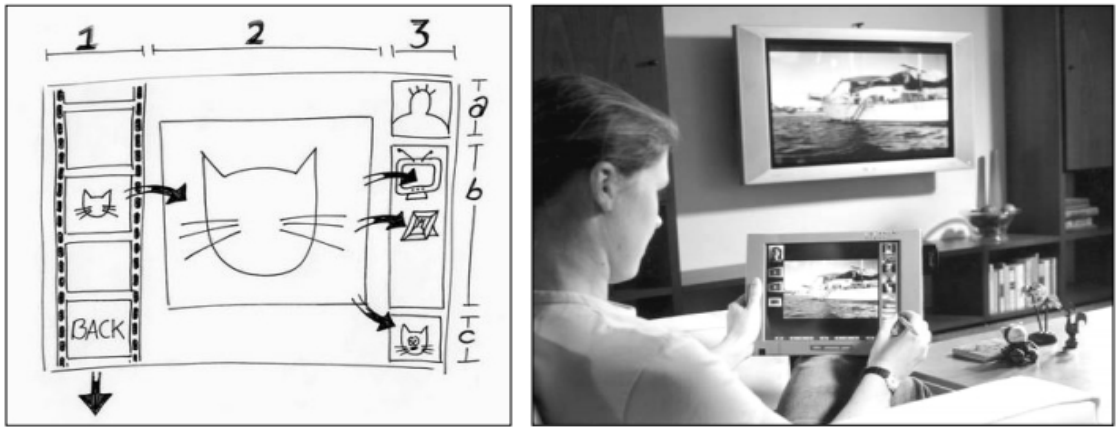

Figure 19: Digital Photo Browser, by Hoven and Eggen (2003), uses souvenirs as a graspable user interface to cue on-screen sets of photos.

Designed as a browser, the device creates an archive of digital photos displayed on a touch screen, where 'touching' a photo on screen triggers the display of associated photos

on the same screen. This invites users to interact with photo archives through graspable objects: an object primed with a wireless tag placed near to the screen triggering linked content on-screen. The system relies on pre-attached associations between objects and digital content, encouraging reconstruction based on audience browsing.

Nunes et al. (2009) explore this further by using physical memorabilia to access larger stores of digital photos, where a family member interacting with a memorabilia item triggers associated digital photos to be displayed on the nearest screen in the home. Likewise, *Memodules* (Mugellini et al., 2007) connects augmented memorabilia to existing devices at home (*Figure 20*).

Figure 20: Memodules, by Mugellini et al. (2007), are small tagged physical objects that form a link to multimedia information that can be accessed by several devices.

Though technology-driven, the proposals forge links and narrative between digital repositories and physical artefacts. The systems described so far promote active reminiscing by encouraging people to engage in intense reminiscing sessions similar to that of spending time looking through photo albums with family and friends. They support explicit memory cues, letting the user decide how memorabilia objects are used to explore associated knowledge, where offering reminiscing in this way requires time and full attention of users, so episodes are likely to be infrequent.

With widespread adoption of digital technology to capture evidence of memories, introducing systems like those described above, begin to offer new ways to access our memories, and by supporting the use of objects as triggers to memories, they offer new ways to link people's habit of collecting memorabilia to existing digital memory archives, such as digital photo albums.

Augmented photographs

As photographs having been long-used to record memorable events, support for collecting and sharing them has changed to complement technological progression. Digital photography has changed the way people take, review and share photos, as well as how existing printed photo collections are used. Researchers of memory support systems have introduced concepts for both digital photos, for example, *StoryTrack* (Balabanović et al., 2000) and *The Personal Digital Historian* (Shen et al., 2003), and enhancing printed photographs like the *Audiophoto Desk* (Frohlich et al., 2004) which group, categorise and link additional content, as well as creating new spaces for reminiscing and storytelling. Others (Frohlich et al., 2008; Kirk et al., 2006) consider people spending time 'working' on their photos to enhance and prepare them ready for archiving and sharing at a later date. I now explore these individually to discuss their offerings to personal remembering.

StoryTrack (Balabanović et al., 2000) is a portable device designed for sharing images of digital photos. The device consists of a screen to display photos with a navigation strip to advance through collections, allowing the recording of anecdotes linked to photos by the user, and grouping photos into story collections viewed as a slide show remembered through the accompanying commentary. However, grouping photos together with a running commentary restricts and fails to account for the reconstruction of memories at recollection where, to aid natural remembering, new memory systems should help facilitate and initiate recollection rather than explicitly retell the memory.

Kodak researcher Neustaedter (2008) considers access to digital photos within family life by suggesting new ways to display alongside family activities. He proposes combining photo displays with other tools like calendars, to see how they might appear on large displays already used in homes. Likewise, considering how people browse photos, the *Audiophoto Desk* (Frohlich, 2004) offers additional audio content linked to groups of printed photos. The system, a table with an overhead camera, recognises placed photos and triggers pre-recorded audio stored on a hidden computer. Using a desk suggests a shared space where groups of photos and associated audio can be played simultaneously, creating unique connections between photos and layered audio. The *Personal Digital Historian* (Shen et al., 2003) also uses a table surface for photo exploration, where users browse through categories that invite multi-user interaction and storytelling.

These systems encourage remembering as shared events, engaging in conversations around the images and audio presented, however, having fixed locations limits their use needing people to actively go to the system to interact. They also rely on people attaching

Figure 21: from top left, clockwise

StoryTrack, by Balabanović et al. (2000), is a portable device that displays photos and is used to share stories with other people.

AudioPhoto Desk, by Frohlich et al. (2004), recognises physical photos place on the desk and automatically plays associated sounds.

What are the odds? by Erve et al. (2011), uses small screens to display content from personal digital archives, with categories chosen by rolling dice.

Personal Digital Historian, by Shen et al. (2003), promotes informal storytelling around a table.

digital content to photos requiring commitment and perhaps not offering a long-term solution.

More playful ways of browsing vast collections of digital photos are proposed by '*What are the Odds*' (Erve et al., 2011), where rolling dice acts as a search filter. With each dice rolled deciding whom, what, when, where and the weather at the time the photo was taken, the photos displayed on the three thin screens are unexpected, random and uncontrollable. This concept offers forgotten photos and combinations of photos not viewed during conventional viewing sessions. It offers a playful way of exploring large collections of personal photos, away from the computers they reside on, yet still keeps the qualities of the physical photograph by using a small thin paper-like display.

The *Cueb* system (Goldsteijn & Hoven, 2013) facilitates supporting family members in sharing their personal experiences. Two cubes contain the personal photos from each family member, where shaking the cubes randomly displays images, whilst holding the cubes together displays shared experiences. They support exploration of digital photos and the sharing of personal memories. Aimed towards parent-teenager communication, the cubes encourage discovery, storytelling and comparison of experiences, generating surprising photo combinations that spark conversation around what is displayed. Overall, these latter proposals explore the new capabilities and possibilities for digital photos and their associated technology.

Other research on the display of digital and printed photos in the home (Lindley et al., 2008; Taylor et al., 2007) identifies issues and ways technology might assist. Taylor et al. recognise three areas around displaying photos in the home: the preparation of the display, the obligation to display and the tensions around curatorial control. After interviewing people about the social practices around displaying photos, Taylor et al. propose 'low-tech' design concepts that encourage new ways of viewing. Their *PhotoSwitch* concept (*Figure 22*) poses questions over who takes control of curation by offering choice to other family members over the photo currently on display.

Figure 22: PhotoSwitch, by Taylor et al. (2007), encourages people to consider why some photos might be shown and others not. (Source: Microsoft Research)

Publishing memories

Another way people display and share photos, though more publicly, is by publishing them as stories and 'memory films' on websites and television. *Digital Storytelling* (Lambert, 2002) offers people the chance to publish, share and archive personal memories as compelling stories with associated photographs and images. Developed over the last decade as people explore opportunities the internet and other media channels offer to support our memories, consuming other people's autobiographical memory accounts has grown in popularity with websites like *Next Exit* (Atchley, 2003) and major project funding from national media companies, like BBC's *MemoryShare* (BBC, 2012), *Telling Lives* (BBC, 2003) and BBC Wales' *Capture Wales* (BBC Wales, 2003). Initially developed using memorabilia scanned and 'made digital', digital storytelling methods, developed some 10 years ago, show people embracing technology to help organise and share evidence of their memories, developing at a time when people embraced digital photography and online photo sharing websites (for example, *Flickr* and *Facebook*).

The systems described rely on people being pro-active in archiving content for the system, where people have to make connections between objects, images and audio, and in many cases, record or collect specific audio descriptions for the system. These systems use methods in addition to current memory archival practices, and require additional user input.

Ambient memory triggers

Other systems offer ambiguous triggers to memories, not through streaming linked content as described in the previous systems, but by unexpectedly making people aware of the presence of objects. In the following, objects are highlighted with light when linked to the current day, for example *Glow Tags* by Philips (Marzano & Aarts, 2003), or randomly if they have been forgotten in the environment, as with *Benevolent Poltergeists* from the '*Alternatives*' project (Gaver & Martin, 2000). They introduce ways systems could offer 'hints' to personal memories by encouraging people to notice objects in their environment and inviting closer inspection or consideration.

Glow Tags are small form-prototyped devices (bookmarks, clips, ribbons and sticky labels) attached to objects by the user and triggered by context related information like time, date, names and locations (*Figure 23*). Fed with information from existing systems (computer emails, telephones etc.) *Glow Tags* 'glow' when a link is found between objects and information, acting purely as background prompts and relying on people to interpret.

Figure 23: Glowtags, by Philips Design (MiME project), can be placed in the physical environment and store small amounts of contextual information (such as time, date). They will activate in certain circumstances when they notice a connection by glowing, serving as a subtle trigger to the person who placed it or sees it.

Similarly, the *Benevolent Poltergeists* proposal uses light to highlight objects in the background, relying less on context specific information and more on randomness. The proposal is for lighting to move between objects in the home, where the unconventionality of lighting the object causes people to notice items that blend into the background and become forgotten in the everyday setting of the home. The proposal also suggests small robots that could move possessions around to draw attention to them.

These proposals suggest the ability of new systems to encourage remembering implicitly. Through passive interaction, systems do not need to rely on people inputting information and making associations with content, or returning to engage in remembering; a criticism of proposals described previously. These examples show new proposals encouraging remembering in ways sympathetic and inconspicuous, offering information in the background where it can be acted upon or ignored, but not reliant on people's time.

Many of the systems I have discussed favour prescriptive methods of remembering, relying on people being pro-active and explicit in creating memory triggers. Though they offer reminiscing value, they do so by focusing on very specific elements of how people remember rather than exploring the whole: there are many different facets and theories around autobiographical memory, in the way people create, store and recall memories. Current offerings still focus on exact reproductions of memorable events, for example photographs and audio recordings, and show little consideration for the constructionist approach of the reconstruction of memories over time. Proposals may be more suited to supporting natural remembering if they address the evolution of memories and changes in remembering over time.

The systems described do offer new ways to experience and preserve aspects of personal remembering, though they predominantly focus on the home and physical evidence of memories. However, with people capturing potential memory triggers on the

go, ubiquitous cameras and instant access to online sharing, people have responded by actively using new ways to capture, edit and share memorable experiences. Mobile and ubiquitous computing allows people to preserve evidence of their autobiographical memories in different ways and in the next section I look at the many systems offering this support.

New ways to remember

More and more people frequently travel and explore new places, as well as living and working all over the world. As many people's lives are no longer fixed in one location, the vast storage potential of digital collections of memory evidence offers value. People have embarked on generating a digital plethora of potential memory triggers, and although printed photographs are still used (Sarvas & Frohlich, 2011) they have to find a place alongside extensive online albums 'published' to see and share remotely.

Losing physicality

People may always desire keeping physical memorabilia but now, people's archives of memory triggers are more likely to be created as digital photos, music, videos and emails etc. (Bell & Gemmell, 2009). From blogging software and memory storage sticks, to camera phones with ubiquitous storage and other 'life capturing' devices, huge amounts of personal content is collected and shared digitally. Dubbed '*Life Caching*' by Trendwatching (2004), "collecting, storing and displaying of one's entire life, for private use, or for friends, family, even the entire world to peruse" has developed into many online diaries and indexes to people's lives.

Technology companies constantly update applications to support trends, seen with Nokia for example, whose *Lifeblog* (2008) software produced timelines based on the content on a person's mobile phone, arranging it chronologically and publishing it on their personal *Lifeblog* site (*Figure 24*). Similarly HP developed *StoryCast* (2005) which creates stories from narrated photo-slide shows accompanied by the storyteller's voice, and Samsung encouraging people to 'Show Your World' (Trendwatching, 2004) in an advertisement campaign suggesting people produce mini-movies of daily life.

Figure 24: Lifeblog, by Nokia, was a multimedia diary tool that automatically collects and stores photos and sounds the user creates, organizing them into a searchable timeline. (Source: Nokia)

In addition to these service offerings, researchers from large technology companies have used camera-phone technology to apply sensors for additional mobile ad-hoc digital photo taking (Kindberg et al., 2005; Rost et al., 2005), recording the context in which digital photos are taken. Other research projects (Håkansson et al., 2006; Bitton & Agamanolis, 2004; Ljungblad et al., 2004; Håkansson et al., 2003) propose additional information helps to organise, archive and present digital photos, taking the emphasis away from people having to maintain huge digital memory archives.

Extensions of this approach sees entrepreneurs embracing people's desire to make sense of their online digital self by offering services that create personal life histories by writing autobiographies. The company, of which there are many similar such as Ipernity and Biowriters.NET, writes their customer's own biography through interviews and images gained from having access to their personal digital archives (photos, music, emails, videos, etc). Similarly, *Digital Storytelling* (discussed in the previous section) and *Digital Scrapbooking* (Two Peas In A Bucket, 2012) provide tools for creating stories and developing a coherent understanding from digital information.

Keeping everything

To help people archive large amounts of digital information people are being offered ever-increasing amounts of digital storage space, encouraging them to collect and store everything, but with keeping everything how will people experience potential memory triggers if photos of special events reside amongst general emails from work? The way people archive and create access to their digital archives needs to be designed and supported with as much priority as the design of any new system that allows them to capture it.

In support of this collect-all approach, some major research initiatives (described below) are considering new ways for people to reminisce over some of this information. Documenting and recording 'life' is a challenge technology research companies (HP Research Labs, 2012; Nokia, 2012; Microsoft Research, 2012), research groups (Eindhoven University of Technology, 2012; MIT Media Lab, 2012) and research council initiatives (School of Sociology and Social Policy, 2011; Fitzgibbon & Reiter, c.2002) strive to accomplish. Whilst recent research initiative *Materialising Memories* (Hoven, 2014) considers "what desired relivings of memories are" and proposes smaller-scale innovative media support products more suited to aspects such as forgetting, the majority of research initiatives still focus on the ability of technology recording copious amounts of data about our lives, with 'capture' systems developed to fit unobtrusively into everyday tasks.

Life-logging

A life-log brings a "digital record of the totality of an individual's experiences" (Dodge & Kitchen, 2005) in a form that can be accessed as and when needed. Applying this to early psychology theories suggesting that human memory records and preserves life as it is experienced into a 'library' system of stored memories (Cohen & Conway, 2009; Conway, 1990), 'life-log' research similarly captures everything as it happens for the goal of future recollection. Described as '*Total Capture*' (Sellen & Whittaker, 2010), these always-on systems aim to capture everything in everyday life, whereas other forms of collecting data sees more context-specific capture with certain situations triggering the automatic capture of information, like change of place, charged emotions or specific times of the day (Hodges et al., 2006; Kern et al., 2004).

Over the last 20 years, challenges of life logging have been explored through projects such as *Remembrance Agent* (Rhodes & Starner, 1996), *The Familiar* (Clarkson et al., 2001), *MyLifeBits* (Gemmell et al., 2006), *LifeLog* (BBC, 2002) and *What Was I*

Thinking (Vemuri & Bender, 2004). *MyLifeBits* (Bell, 2001) creates a digital store of all personal information over a lifetime, where the experiment-side of the project sees Bell capture all photos, pictures, books, articles, CD's, letters, voice recordings, phone calls, television, radio, cards, papers, presentations etc, and stores them digitally. The software-side by Gemmell et al. (2006) focuses on processing and archiving, linking content with tags, annotations and ranking to make sense of the vast quantities of information stored (*Figure 25*).

Important is not just the technology that supports the capture of life-log data but how this data is dealt with and consumed at a later date (Blum et al., 2006). Initiatives, like DARPA's *LifeLog* (BBC, 2002), use sensory augmented wearable technologies to provide a filter to collected life-log data by offering structure through situation specific capture triggers. Microsoft's *SenseCam* (Hodges et al., 2006) uses a camera and various other sensors worn around the neck to automatically take still images when there is a change in a person's activity. The device records sensor data taken at the same time as image capture, like light levels and temperature. SenseCam's aim is to allow a review of data to help the wearer recollect earlier experiences that have since been forgotten.

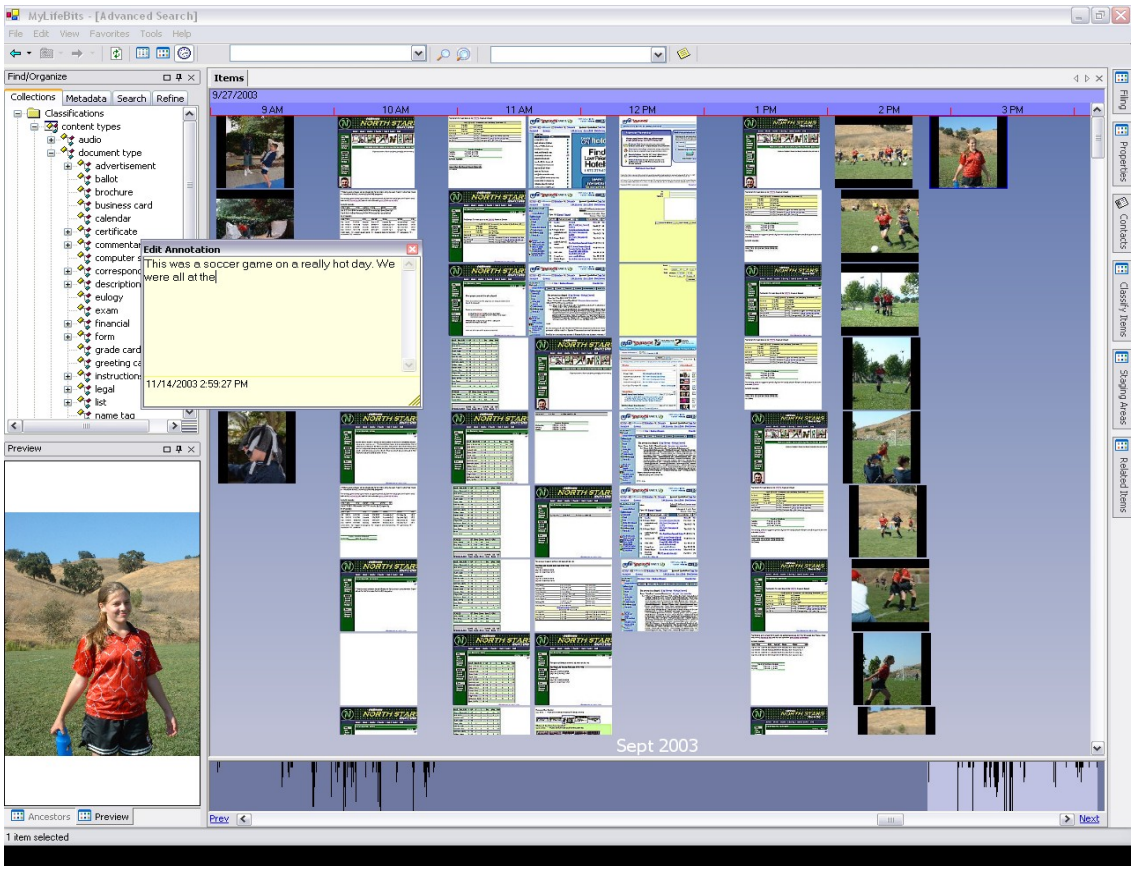

Figure 25: MyLifeBits, by Gemmell et al. (2006). (Source: Microsoft Research)

Whilst there is many suggestions of the benefits of life-logging technologies put forward by researchers, ultimately they strive to offer effective support for remembering the past. Working with end-users, Byrne and Jones (2009) consider how these large data sets collected from life-log capture can be filtered into meaningful introspection around personal memories, by creating narratives and stories.

During the study, participants reduced the content collected from the life-log by choosing images relating to a story from their 'life'. Though this process shows just how much time is needed to analyse life-log content, it also shows how technology aids remembrance of forgotten events and eliminates 'false' memories by providing evidence. However, this goes against aspects of storytelling where some stories may not be factual accounts but constructed around elements of truth and fantasy (Sabnani, 2005; BBC Wales, 2003). In support, Byrne and Jones found participant's conversational stories did not map exactly to the digital representations from the life-log.

Other researchers (Kalnikaite et al., 2010) find offering abstract overview information, like the location of the life-log capture, alongside more detailed information of the photos taken, allows a person to quickly search the data. This approach allows users to navigate through past locations with the ability to zoom down into detail and imagery for specific event information.

Ease of remembering everything

Though these projects explore some of the more experimental life-logging technologies and are a long way from people's current desires for memory support, they do show how this ease of recording everything could change how, why and when people want to engage in future reminiscing. Petrelli et al. (2008) share concerns about the 'exhaustive capture' of their collect-all approach, missing people's need for active remembering. They suggest technology could move more towards developing ways to actively support reminiscing in multiple and highly flexible ways.

Sellen and Whittaker (2010) suggest presenting and representing information in highly abstract ways (in the life-logging system), may in fact support new ways to reflect, where personal reflection is more about reviewing patterns of behaviour rather than individual specific memory-related events. As a result, value around reliving the past may become re-appropriated as people see things from a new perspective and frame information differently (Harper et al., 2008).

Many life-logging projects have been criticised for being technology-driven rather than end-user-driven (Sellen & Whittaker, 2010), where the real impact of these systems are not fully explored from the perspective of the person using it. Life-capture technologies offer valuable tools for gathering information and more consideration is needed around how this information might be repurposed into meaningful memory aids. The need is to develop tools and devices that offer a filter to the data, presenting information in a timely and purposeful manner that matches peoples current needs and desires for reminiscing.

Dealing with digital

Digital archives of personal information promise everything fallible memories cannot: access to every moment of our past, whenever we need it. In his book "*Delete: The Virtue of Forgetting in the Digital Age*", Mayer-Schönberger (2011) remarks how the devices for recording life experiences have become so inexpensive and easy to use, it is much simpler to allow information to grow and collect in digital memory archives than it is to delete it where "forgetting has become costly and difficult, while remembering is inexpensive and easy." Referencing the work of Bell and the *MyLifeBits* project by Microsoft, Mayer-Schönberger discusses how such projects highlight how "society's ability to forget has become suspended, replaced by perfect memory."

Companies, like *Narrative* (2014), have made progress in attempting to commercialize a life-log system for personal use, but are still some way from fully illustrating consumer benefits (*Figure 26*). *Narrative*, a small wearable camera and GPS device, automatically takes photos on the go, requiring little interaction from the wearer; they simply wear the device, charging it every few days via their computer during which images are automatically uploaded and stored.

Narrative advertising entices people by offering a chance to review "the name of the restaurant they went to last night" when they are unable to remember it themselves, with additional support offering automatic categorisation of the images collected. However, collecting two images every minute, the device may feel intrusive and an invasion of privacy if it fails to justify a need to collect that amount of personal data about where someone has been and what they have done. It does show, however, the current potential and possibility of digital capture and storage of prospective memory triggers.

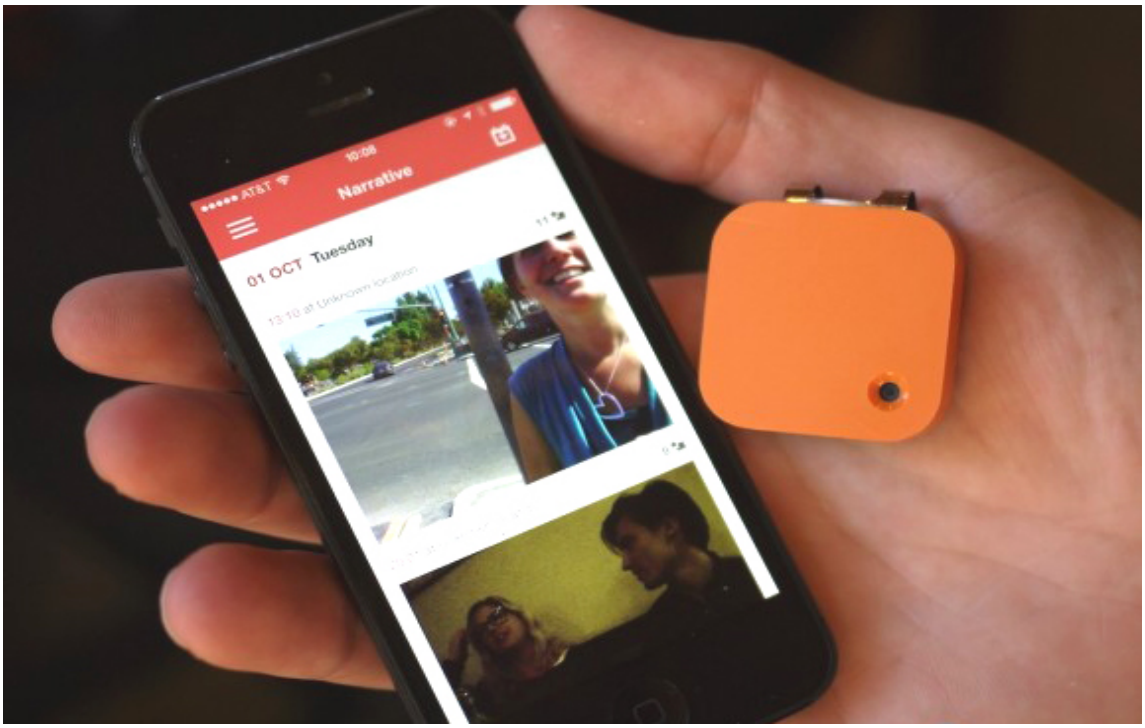

Figure 26: Narrative Clip, by Narrative, is a commercially available, tiny automatic camera and app offering searchable and shareable photographic memory. (Source: getnarrative.com)

A design concept that comments on the juxtaposition of large amounts of stored digital content against the fallible nature of human memory is *PY-ROM* (Chi et al., 2009). The concept is a "one-time use video capture and storage device that encourage memory appreciation." A two-headed matchstick allows people to record a short video when one end is lit, offering one-time playback when the remainder of the match is lit from the other end (*Figure 27*). Designers of *PY-ROM* consider how people obsessively document their lives when they are given access to technology and as a result, the digital content is often devalued and forgotten when it is stored digitally.

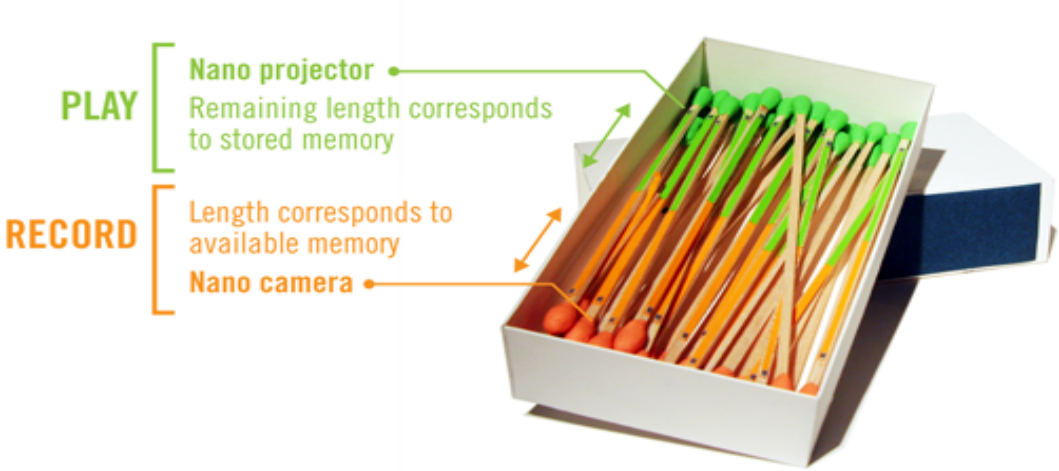

Figure 27: Py-Rom, by Chi et al. (2009), is a matchstick-like video capture and storage device that offers one-time use, encouraging memory appreciation. (Source: Xiao Xiao, MIT MediaLab)

Whilst *PY-ROM* forces people to carefully consider content due to its disposable nature, its proposal is more a statement about digital content, exposing the character of permanence by offering the exact opposite. *PY-ROM* offers space to critically consider these issues but the practicalities of the system opposes the desirability of digital content: relative ease of capture and the capabilities and permanence of storage. To suggest a system reacts otherwise destroys expectations for what digital content offers.

Exploring digital archives

Digital archives offer huge potential for storing evidence of personal experiences, though Petrelli and Whittaker (2010) observe how families that create these seldom access them themselves (Petrelli et al., 2009). When shared on social networking sites access becomes offered to all acquaintances together in one place with work colleagues, friends, relatives and distant acquaintances treated the same. With no filter over which 'friends' see content posted, photos shared via these websites present family photos to close friends and families, as well as long-lost school friends and acquaintances perhaps not spoken to in years, and work colleagues. Photos, which in the past may only have been seen by people invited into the home, get shared with people most would not even consider bringing home, in a relatively public online space for all to see. With copious digital photos, potentially seen by hundreds of social network acquaintances all over the world at any time, future episodes of reminiscing may become more serendipitous and random as people fail to encounter their entire digital collection.

Leong (2006) questions the value and benefit serendipity can bring to such digital collections with his studies based on randomness, exploring new ways to encounter music collections through random play interfaces. He discusses how mood and context influence serendipitous encounters with music by using the shuffle interface, and in doing so, exposes examples where music is received both unexpectedly and in ways sympathetic to current mood. A study from Leong et al. (2011) shows a user abdicating choice over when personal digital photos are displayed on a digital frame, bringing new value and meaning to exploring personal memories. The *Photo Display System* (*Figure 28*) displays personal photos randomly, showing how serendipity and reflection can present through random meetings with personal digital content. Through this system not offering user control, instances of involuntary remembering occur where, for once, the vast quantities of personal digital content people collect is beneficial in enabling a system to deliver instances randomly, unexpectedly and perhaps long-forgotten.

Figure 28: Photo Display System, by Leong et al. (2011), considers random exploration of personal digital content, determined by the roll of a dice.

Other researchers discuss additional benefits of random encounters with personal content. *Pensieve* (Peesapati et al., 2011) is a system that pushes reminders, such as photos, music or written communication, to people to encourage reminiscing. Explored through two approaches, Pensieve (*Figure 29*) sends general impersonal comments, or content from personal accounts on *Flickr, twitter, Picasa, Blogger* and *Last.fm*, depending on user preference and chosen frequency for receiving the information.

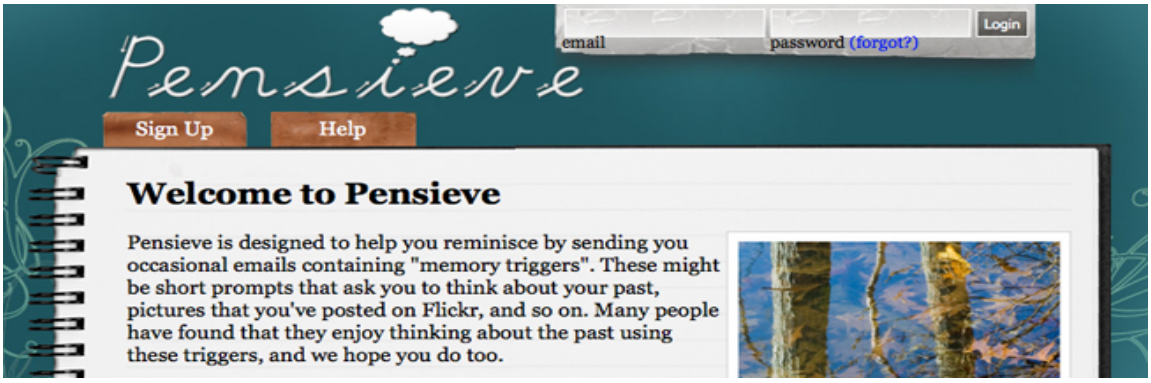

Figure 29: Pensieve application software, by Peesapati et al. (2011), proposes random emails to present prompts and potential triggers to memories. (Source: pensieve.cornellhci.org)

Designers of these systems propose people could receive random prompts to their memories whilst attending to specific focused tasks, for example at a screen reviewing emails or purposefully accessing a website to view the prompt, like *Facebook* for the Pensieve FB application. Whilst receiving random prompts to our memories benefits personal remembering and creates moments of involuntary remembering, people may not welcome receiving this information if prompts arrive at inappropriate times.

Of systems that feature serendipity and randomness, most focus on using personal content. Whilst a great deal of this becomes generated and stored through other tasks (than purposeful memory collection), earlier exploration around the nature of memory (see *Chapter 1*) describes many examples of memories triggered daily happening through encounters with cues not personally owned. Though personal digital content does not support this aspect of remembering, it does play an important role in the creation and preservation of an archive of memory information, offering opportunity for future memory recall. As personal digital archives grow rapidly, systems proposing new perspectives and experiences to review this content are important.

New ways to consume social media

The popularity of social media sites attracts a wealth of additional support applications, many re-appropriating data and offering new channels to consume content through abstracting and presenting new visualisations that encourage reminiscing. *Museum of Me* (Intel, 2012) uses photos from personal Facebook accounts, allowing users to experience them as if they were visitors to their own museum (*Figure 30*).

Figure 30: Museum of Me, by Intel, is a tool that collects a user's Facebook information and puts is on display in a virtual museum in the form of a video, for users to explore.

The application allows people to explore the life they share on *Facebook* as an aesthetically beautiful visualisation, showing visitors walking around their museum with photos hung on the wall like pieces of art. A similar concept by Deutsche Post DHL (2009), *Social Memories,* uses data from a person's *Facebook* account and prints it as a book delivered to their home (*Figure 31*). Well designed and visually intriguing, the book presents social data in new ways showing how companies too are finding ways to embrace the move over to digital archives. With this new service offering, Deutsche Post DHL remark how they have "always been the bearer of memories in the form of postcards and letters. Today written correspondence has been mostly replaced with the digital kind. *Social Memories* brings this back in physical form" (2009).

Figure 31: Social Memories, by Deutsche Post DHL, is a Facebook app that brings together a user's digital content to create a well laid out infographic style printed book of potential memory cues.

There are many other applications offering many more ways to consume personal data from social networking sites, all showing support for people wanting to access the wealth of data they archive daily about their lives. These applications generally offer short-term fixes; a different perspective and new way to consume personal data based on current demands and not intended as a long-term solution.

Inheriting digital archives

It is, in a way, easier to deal with physical memorabilia archives after death than digital, as laws determine the inheritance mechanisms in place to organise the movement of objects to new owners. If people hold more and more important information about their past in digital form how will inheritors know and gain access? Inheriting physical memorabilia produces a finite collection of objects where inheritors may have associated memories or find a functional use for them. With digital memory archives, value to other people may not be so forthcoming. Some digital photos, video and audio may trigger memories with others but potentially there is an overwhelming volume of digital data that is not so easy to deal with.

Researchers (Walker, 2011; McAlear, 2010) have begun to explore this as currently, major companies holding personal digital archives, such as social networking sites, have vague policies for dealing with a person's digital archive after death. The result are organisations, like *The Digital Beyond*, set-up to advise and deal with inheritance and the distribution of digital archives (Carroll & Romano, 2010) if a 'digital will' is in place.

Businesses such as *SecureSafe* (2012), *Legacy Locker* (2009) and *Entrustet* (2008), support requests for digital lives to survive by offering a safe collection of passwords and access information to digital accounts, which are passed on after death to nominated survivors. Others, like *Facebook,* supports the 'memorialising' of a person's social media account when they die (Kelly, 2009), with their 'page' becoming a space for friends to reminisce, allowing for digital grief, documentation and self-expression of their digital identity. These examples emphasise similar importance and value personal digital content has alongside the physical objects traditionally inherited.

Technology researchers are addressing the challenges of inheriting digital memory archives alongside peoples desire for inheriting physical memorabilia. The *Technology Heirlooms* work (Banks, Kirk & Sellen, 2012; Banks, 2011; Kirk & Banks, 2008) by Microsoft Research's Human Experience & Design group (formerly Socio-Digital Systems) presents a collection of design proposals: *Backup Box,* a device that collects the content of your Twitter feed to speculate on its potential value to reminiscing in the future, *Digital slide viewer* that makes a physical repository of online photo collections specifically for inheritance and *Timecard* (*Figure 32*), a system that organises personal digital data into a timeline to aid reflection and reminiscing.

Similar to a digital photo frame but with the qualities of a photo album, *Timecard* allows the creator to produce a personal 'album'. It is a device that collects personal

Figure 32: Timecard, by Kirk & Banks (2008), allows members of a family to build a timeline representing a loved ones life, using digital content and stored and displayed on a dedicated device. (Source: Microsoft Research)

digital data into physical devices and organises this as timelines or themes for heirs to experience. Viewers see the relationships between photos over a person's lifetime, and by combining them with 'public' timelines, other photos from the same period can be compared.

These examples, of which there are many more, show accessing the personal digital data people create and interact with daily holds great value for triggering memories if displayed and presented in appropriate ways. Online spaces offer access to information about people's life experiences and have the potential to cue subsequent reminiscing, but this presents challenges. Digital death highlights issues in dealing with unfiltered digital archives and the potential problems when highly personal information is in the hands of someone else. Researchers have begun discussing ways design can help deal with digital archives but it is an ongoing challenge, especially as more and more people embrace digitally documenting life. As it is now apparent, "Society's most important memories now reside in the electronic archives of the mass media…" (Schacter, 1997).

There has been much research (as discussed in this chapter) on the role technology plays in assisting the capture and storage of evidence of memorable experiences, but these

tools are unable to replicate remembering. A computer is a retriever of information and does not remember experiences, where to remember is to show emotion (Schacter, 1997). The applications designers propose should merely play supportive roles in providing the cues to help a person remember. Personality and true meaning in the retelling of memories needs to come from the person.

Conclusion

Reflecting upon the characteristics of memory I discuss in the previous chapter, this chapter considers how memory support systems currently address the nature of memory. Through the findings, I identify a need to develop tools supportive of lightweight memory recall; an area not yet fully explored by memory researchers. Reminiscing is important in developing relationships between people, events, objects and spaces, but there are issues around the preservation of evidence of memories and the time and dedication needed to archive them.

Of new technology-based systems designed to support memories through memorabilia artefacts (for example, systems designed by Hoven, 2004; Hoven and Eggen, 2003; Stevens et al., 2002; Frohlich and Murphy, 2000) many offer new spaces to access our memories but are less sympathetic to how people *naturally* remember. I feel the majority of systems mentioned in this chapter require too many additional components to engage in reminiscing: the product, pre-recorded edited memorabilia material, presence in the space the product is based, full attention of one or more people, and time to browse the archive.

Collecting evidence of experience has grown significantly by technological advancements that give people convenient ways to document, capture and store their lives digitally. However, accessing personal digital memory archives in meaningful, desirable and purposeful ways that support how people naturally reminisce is not well supported and presents a current challenge for new memory system designers. Current memory systems focus on pro-active enquiry, requiring people to present themselves to the system to engage in reminiscing, but how true to life is this? These systems rarely support existing models of natural reminiscing and accessing memories instead introducing new requirements. Designers might look to support personal memories that are less demanding

and more akin to how people naturally remember: ad hoc through chance meetings with memory triggers.

Current product and system proposals build on the notion of memories being precious, developing proposals that demand the preservation of physical fragments of evidence from the original memory with subsequent remembering focused around the original event. Aiming to make people more productive in storing memories in pure, un-tampered ways is a process people are unable to do naturally and creates a form of synthetic remembering. Memory support systems should not be designed in this way, as systems should not be true representations of people's memories. Memory support systems could instead be developed so they evolve as evidence of memories built progressively over time, with each subsequent recollection.

This summary shows many ways memory support systems might be designed to aid natural remembering more sympathetically. I now use the *Design Speculations* (practice work) for this chapter, to explore some of these themes further. Through my design explorations and discussions with people, understanding around reminiscing practices have inspired a series of design proposals that illustrate the issues to date and set the scene for the next chapter.

Design speculations

The approach I take contrasts with work carried out by researchers already described in this chapter (Frohlich, 2004; Hoven & Eggen, 2003; Stevens et al., 2003; Stevens et al., 2002; Balabanović et al., 2000; Frohlich & Murphy, 2000), by going beyond creating databases of archived evidence of memories associated with objects, to consider other ways to deliver memory cues. I have already used practices around reminiscing and storytelling (see *Chapter 1*) to critique current approaches in the design and development of memory support systems (see *Chapter 2: Supporting Memorabilia, Losing the need for Memorabilia, Dealing with Digital*) and to suggest new approaches (see *Chapter 2: Conclusions*). Understanding these helped me identify how current systems might be improved, resulting in my observations and studies in this *Practice Work* considering key issues around how people use memorabilia collections; how they inhabit personal spaces and how this influences reminiscing.

I asked people who took part in the previously reported camera-kit study (see *Initial design explorations*) about their memorabilia display and storage areas at home. The aim was to discover how memorabilia is used in the home, what is displayed where and what is intentionally hidden. Discussions began around the topography of memorabilia, asking people where they keep memorabilia and why (*Figure 33*). I documented collections of framed photos on display and prominent display areas for ornaments and 'prized' possessions, finding display cabinets full of ornaments taking pride-of-place in shared social spaces, with mantelpieces and new 'TV' mantelpieces hosting shrines to family photos.

Figure 33: Display areas of the home, showing the practice of people carefully ordering and arranging framed photos and memorabilia into focal points in the main living rooms of the home.

During this process, some items were documented in detail to describe the type of object, the memories associated, the memories other people have and the objects that surround it (see *Appendix 1: Memorabilia interviews)*. I also asked them why they chose to display certain items, noting how people ranged from minimalist displayers with one or two pieces in keeping with the décor, to having wall-long display cabinets housing every ornament owned. Location was also important, especially to one person who follows the practice of Feng-Shui. Adhering to this practice dictates where she places objects in her home to promote wellbeing, for example her unconventional hanging of a crystal necklace from a ceiling light. These examples show people led by trends and beliefs, often choosing to display memorabilia objects because of their aesthetic or spiritual value in addition to the memories they trigger.

People assigning rules and scripts to how they deal with objects was evident when they discussed objects received as gifts, and the influence this had on what they did with

them. They described many examples of gifted and inherited objects kept on display as a sign of appreciation.

Igor Kopytoff (1988) identified the sacredness of the gift, with such objects carrying strong attachment, where giving up possession is not just considering giving up the object but an emotional connection to the person who gave it to them. For some, this decision can be met with guilt and is perhaps why one person remarked she would never get rid of them in her lifetime but expressed concern her son would not have the same appreciation when he inherits. When I spoke to her family members about the memorabilia around the house, they remarked that her need to display every item given as a gift influences what they buy her for special occasions, preferring gifts with a short shelf-life (flowers and chocolates) which do not accommodate long-term space in the home.

I designed a series of proposals[5] to highlight concerns around currently unsupported forms of reminiscing identified during the exploration. The issues addressed are *inheriting objects, authenticating memories, collecting content to trigger memories* and *lack of store space for objects*.

The majority of the proposals take the form of 'plinths' with different characteristics that address the issues and convey proposals in specific settings: a vehicle to highlight user behaviour and not integral to the proposals themselves. Using plinths keeps the content local and contained within each (and not with the object), so it can continue in its natural surroundings and state. The final proposal shows additional ways remembering around objects can be supported, through services provided by companies. I have grouped the proposals into sections to identify each issue, with the concepts shown in the context of the home, accompanied with a title and description. I built a collection of plinths to form prototype level to encourage speculation around living with such objects, and invited feedback during an exhibition and symposium at the Royal College of Art (Helen Hamlyn Research Centre, 2004). The reactions from the exhibition are considered in the descriptions that follow.

Inherited objects

The first set of designs deal with issues around *inherited objects*. During the discussions people expressed concern for other people inheriting their memorabilia collection and not being aware of associated memories. People are worried objects may be misunderstood

[5] All design proposals from this thesis are presented together as an accompanying workbook. The workbook of design proposals supports the practice element of this research (along with design explorations) and can be found in Appendix 5.

with regards to memories of key events in their previous owner's life, and that they might be discarded as a result. As people show frustration towards the lack of transfer of memories, designing for this would suggest this type of support for memories is welcomed. Two designs look at how objects can find appreciative new owners, and how new owners can learn and understand about an object's history over time.

The **Patina Plinth** (*Figure 34*) is designed specifically for inherited objects and retells associated memories in the form of pre-stored stories. The plinth retells stories about the objects once the new owner has lived with them for the same time as the previous owner, where the aging of the memory along with the object allows the object to mature, building a patina and establishing greater appreciation of the object's past by the new owner.

The plinth collects oral content by owners recording stories of associated memories or through picking up content from the environment at key events in the object's history, when moved, for example. The plinth stores this content, marking it to the exact time it occurred in the object's history with the replay of content delivered over the same time span; the display offers a precise countdown to the next storytelling episode. As new memories are collected from the new owner, they too are stored ready for the next new owner, creating a dynamic system constantly collecting and distributing content along each life an object has with it's current owner.

The concept supports concerns people have for passing on memories with objects when they change ownership, offering a new way of interacting with second-hand objects and the stories behind the marks, scratches and chips an object receives over it's lifetime. The design takes away some of the secrecy around second-hand objects in not knowing their past and imagining their adventures, but also encourages other forms of interaction: imagine lining up objects in order of the next story due and the anticipation around awaiting the next chronicle in an objects unravelling history. Would you take the day off work if there were a story due, never to be repeated? And, if you had heard a story would you tell it again to make sure the next owner knew the object's historical landmarks?

Another proposal, the **Inheritance Bid Plinth** (*Figure 35*), encourages potential inheritors to bid for an object's affections through leaving their requests and wishes to own the object in the future. On the surface this makes the will making process easier as the plinth replays the recordings for the owner to hear and decide, but critically, this concept questions current methods of distributing objects when owners die.

The plinth is inspired by the way some objects are described and left to people in wills, like, "My favourite hand-carved solid wood wardrobe, painstakingly bought back from India, goes to my beloved grandson who always admired it", and stories from

Figure 34: Patina Plinth

Figure 35: Inheritance Bid Plinth

bereaved family members discussing who should inherit when validating claims through emotionally charged storytelling of what it means to them. Bidding to own an object once the owner has died is uneasy though responses from people this concept was discussed with show appreciation for a system that delivers a practical service during a distressing time.

Reading the will could become a theatrical event with objects handed over to whoever gave the best performance. Such a system could cause people to take on a greedy behaviour when visiting elderly relatives, or simply encourage them to visit more, offering a chance to leave a claim. Ultimately, it could ensure objects end up with appreciative new owners and alleviate potential conflict when possessions are distributed between family members. It also questions the amount of time people spend together, where more time spent with the family and friends you intend to leave possessions to would naturally suggest who potential inheritors should be without the need for such a system. This concept could be seen as a statement about the way families are now dispersed over vast geographical locations.

Designing support for inherited objects offers huge potential for sharing previously forgotten memories and opportunities for memories to live on with new owners. The use of new media technology has already gone some way to promote the preservation of evidence of memories for future owners but has often been through a regimented recital of facts. Considering situations and instances around inheriting this evidence in the design of new proposals, the aim is to deliver this information in meaningful and appropriate contexts.

Authentic memories

In the next designs, I consider the *authenticity of memories*. Inspired by the storyteller at the car boot sale (see *Chapter 1: Design Speculations, Car Boot Video Interviews*) who told different stories about an object's past every week, these proposals suggest ways memories can be authenticated and the consequences of encouraging this.

The **Truth Plinth** (*Figure 36*) connects the storyteller to a lie detector, giving other people in the room indication as to whether what they are hearing is true or not. People often exaggerate stories, so the *Truth Plinth* ensures truthfulness by the storyteller: if they lie they receive an electric shock. The outcome should ensure factual, not fictional, stories. Critics may believe the *Truth Plinth* would make stories less compelling, as people often exaggerate storytelling to enliven or clarify explanation. Elements of exaggeration may be

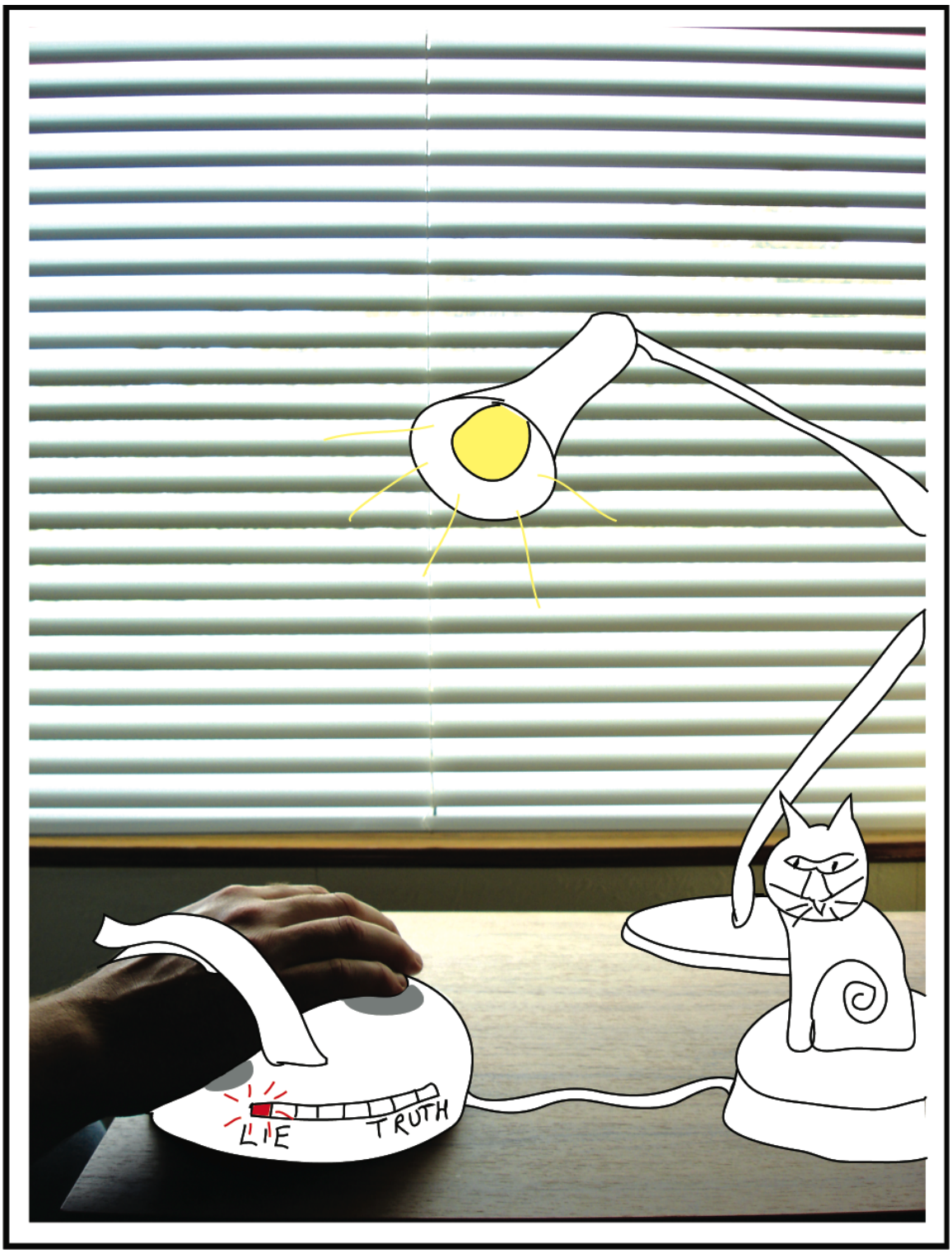

Figure 36: Truth Plinth

found in most stories told, where true authenticity becomes less important than the elaborations told around it, which ensure it is compelling to the audience. In this sense I question whether a truth plinth would make a story better or worse as people are smart enough to accept exaggeration through rationalisation of what is presented.

The next three plinths discuss *authenticity* very differently to *Truth Plinth*. Rather than understanding authenticity as representing truthfulness, the following consider ways of making the experience true to the storyteller through context.

The **Conditioning Plinth** (*Figure 37*) provides context and scene setting for the retelling of memories. The plinth records associated audio stories of objects from the owner, as well as recording the environmental conditions the story is told in. To hear the story again, the plinth uses 'object conditioning' techniques to bring the object to the same state it was in when the original story was told. Sensors and displays placed around the outside of the plinth measure and indicate current conditions. The example in *figure 19*, *"The new owner of this object didn't have an outhouse like the one Granny use to keep it in, but they've found that under the sink offers the same cold, damp, dark conditions"*, shows new owners encouraged to seek out new locations in replacement of environments no longer available. Supporting environment and place as triggers to memories emphasizes understanding and appreciation of the original event.

The *Conditioning Plinth* concept inspired another design, the **GPS Plinth** (*Figure 38*), which uses GPS to locate 'birth-places' of memories and retells memorable stories when objects are in the exact location memories were created. Emphasizing the importance of 'place' in understanding and authenticating memories, *GPS Plinth* asks similar questions to *Patina Plinth* (*Figure 33*): if new owners have to build an understanding of the conditions around original memories, for example, time for the *Patina Plinth* and environment for the *Conditioning Plinth*, does it offer greater understanding and appreciation of the memories someone else has associated with an object?

Another concept authenticating memories sees the **Anniversary Plinth** (*Figure 39*) printing out factual information on specific dates memorable to the object. The plinth offers prompts to an object's history, for example, a picture of a child and the plinth printing out a birthday wish on their birthday. As with *Patina Plinth*, the content for *Anniversary Plinth* can be collected voluntarily through people sending messages to the plinth, or involuntarily by linking it to other date-stored media, like calendars. On the plinth, there is no indication to when information is printed, but it happens in real-time on the dates associated with the stored content.

Figure 37: Conditioning Plinth

Figure 38: GPS Plinth

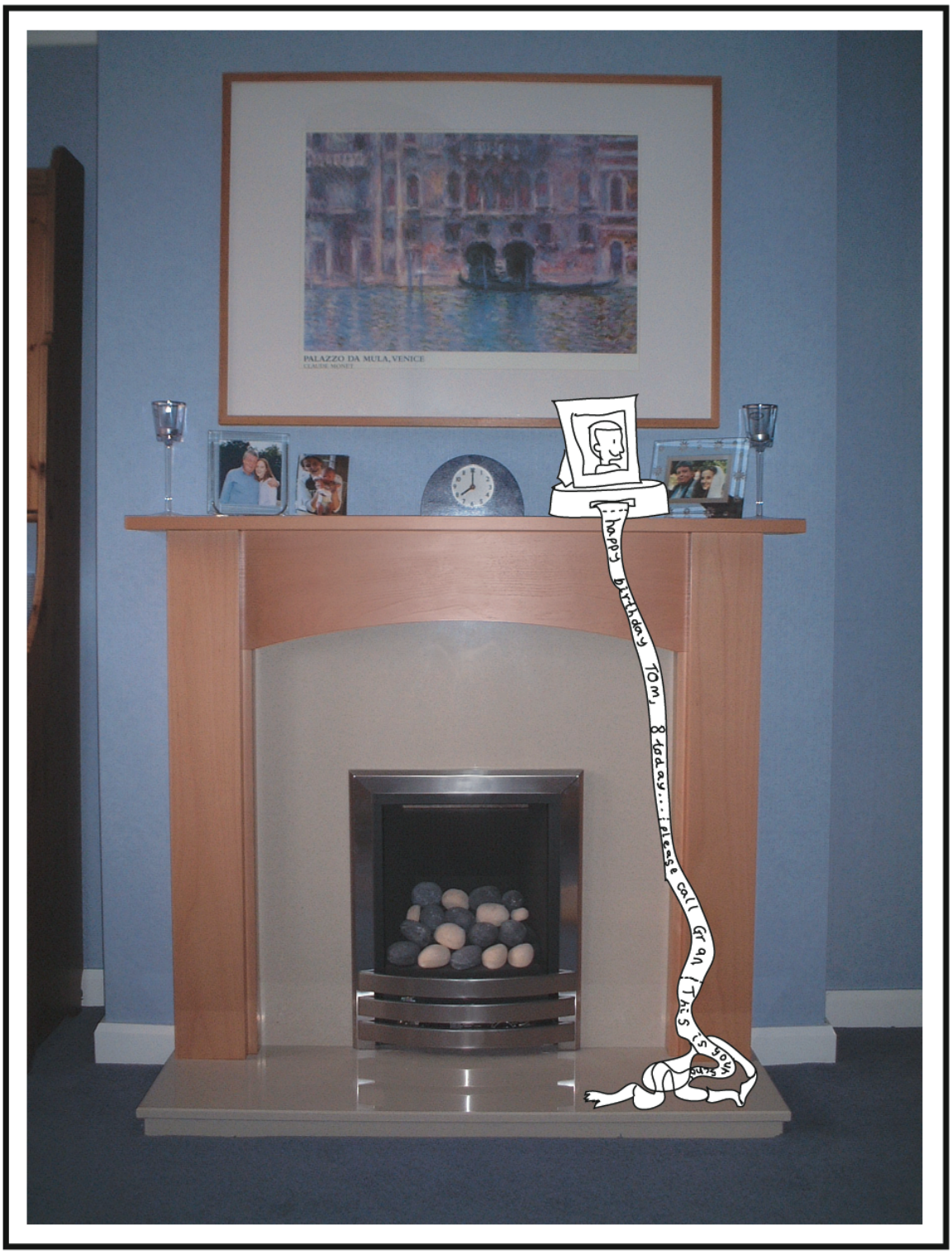

Figure 39: Anniversary Plinth

This plinth generates information frequently compared to concepts like *Patina Plinth,* as printed information may relate to dates repeated annually like birthdays or anniversaries. This plinth could also be used as an output for messages sent between people: relationships between people who share memories of the object intensified by sending messages to each other through the plinth, for example, a message from Grandma asking the child to call her as they have not spoken for a while. In terms of reminiscing, the plinth provides a space to share memories and thoughts that is less confrontational than a conversation between people where a printout can be acted upon or ignored. At the very least the plinth may trigger a memory, but it may go further to initiate additional communication.

Though these proposals provide insight and authenticate different aspects of remembering, they do not suggest knowing the truth around memories is always beneficial. Discussed in relation to the car boot trader (see *Chapter 1: Design Speculations*), hearing a memory a person make judgement around its authenticity. These proposals suggest technology could offer support through authenticating aspects like related dates and facts. More interesting is how people would react to such proposals. How would people choose to share memories around objects if there were barriers that protected or exposed authenticity? Would memories be shared between people more freely or would they stay with the owner so that only they knew the truth?

Stored memorabilia

I use the final design to comment on the changes in *storing and displaying possessions*. The need to create more living space has forced the conversion of valuable store space (see *Chapter 2: Using Memorabilia*) and results in keeping less or finding new places to store possessions. The popularity of self-storage offers new ways to encounter possessions.

Memorabilia Self-Storage (*Figure 40*) is a proposal for storing memorabilia by sending possessions to a storage facility when they are no longer needed, but perhaps still trigger memories; similar to storing toys in the attic no longer played with but still having sentimental attachment. The *Memorabilia Self-Storage* service stores these possessions for many years then randomly and infrequently returns them to their owners through the post. Receiving items this way would trigger long-forgotten memories around these objects unexpectedly and involuntarily.

Figure 40: Memorabilia Self-Storage

With the loss of attic space in homes, this concept goes some way to replace the euphoric feeling of discovering an object long lost and forgotten. Though the concept triggers memories in a similar way to exploring the attic, I argue the possibility of not knowing you own it, for example, a parent storing childhood toys with the service, might make the experience even more special. Childhood memorabilia could be returned once the child reaches an appreciative age, joyously remembering playing with it when they were younger. With keeping less memorabilia at home, this concept questions how people's interaction with objects and subsequent triggering of memories is affected. By having fewer physical objects to trigger memories does future reminiscing occur less, or do the fewer objects kept cue more meaningful memories?

The intention of design proposals at this stage is not to offer solutions to concerns around personal memories, but to stimulate thought and discussion of what might happen with such systems in place. I use these proposals to consider how people's experiences of memories associated with objects can be extended and altered beyond systems and practices currently available.

Throughout this chapter I discuss current memory support systems generally supporting prescribed explicit, intense and proactive memory recall instalments. In the next chapter I propose ideas for new memory support systems that are more akin to how people naturally remember and value spontaneous, lightweight memory recall. Is it possible to develop new criteria that mirror the characteristics of memory (*Chapter 1*)? I begin to introduce new theories and systems that orchestrate and provide this unexpected link to our past.

CHAPTER 3

Designing for spontaneity

Introduction

This chapter introduces the gap in knowledge around support for reminiscing. There is disparity between the nature of memory (*Chapter 1*) and the approach currently taken by designers of memory support systems (*Chapter 2*) that fail to address aspects of personal remembering. Current systems focus on making people more productive in keeping evidence of memories in pure un-tampered ways; a process people are unable to do naturally, creating a form of 'synthetic' remembering. Instead, support could be designed around how people naturally encounter their memories: ad hoc and unexpectedly whilst going about everyday activities.

So, why is unexpected remembering better? Current support (see *Chapter 2: Supporting Memorabilia, Implications for Memorabilia* and *Dealing with Digital*) relies on explicit, pro-active memory recall, offering a 'dose' of reminiscing value where people have to self-prescribe time to access previously captured and stored memory triggers. Where this precious time may be hard for people to find, I have identified autobiographical remembering can be encouraged and enhanced through the serendipitous and unexpected episodes of remembering that frequents daily life. Finding long-forgotten photos fallen down the back of a cupboard and rediscovered when moving furniture or relocating belongings to another space, forces people to touch and handle possessions resulting in instances of involuntary remembering. These processes offer guaranteed reminiscing but how can this emotional and memory-rich event be supported by technology? To explore how, I first develop understanding around involuntary remembering.

I begin this chapter by considering specific writings in philosophy and discoveries in psychological research around involuntary remembering and how this can be applied towards new reminiscing approaches. I progress to look at 'clues' as to how design can provide this support with each developed around current situations and phenomena, for example, specific elements of human behaviour, the impact of new media trends and inspiring contemporary art projects which touch on the theme: a diverse collection, but all

merit further exploration as they support aspects of involuntary remembering. Finally, I use design concepts presented alongside the 'clues' to illustrate ideas for support.

Current understanding of involuntary memory

To understand more, I refer to discussions around involuntary memory in literature for guidance. Referenced in the past by philosophers (Benjamin, 1999) and in literature (Proust, 1928), involuntary memory is now a distinct research strand in psychology (Berntsen, 2007; Mandler, 2007; Kvavilashvili & Mandler, 2004; Mace, 2004). Understanding more around the components of involuntary remembering reveals more about how people naturally remember and the situations that spur involuntary memories.

Where voluntary memory is an ability to recall past memories as and when required, in contrast, involuntary memory is uncontrollable as memories are recalled unexpectedly and with surprise, causing far more emotional impact (Berntsen & Hall, 2004). Prominent (and early) work published on the subject, the work of Proust (Hillenaar, 2004; Proust, 1928) and Benjamin (Leslie, 2001; Leslie, 1999) is often discussed. In an essay written about the work of Benjamin, Leslie states:

> Involuntary memory provides an unanticipated link between an experience in the present and one in the past. It confounds linearity, disrupts temporality – and it inclines towards discovering utopian potential. (Leslie, 2001, p.68)

And, it is this temporal moment outside time, 'a state of suspension,' in which Proust (1928) describes his famous encounter with a madeleine where a memory was triggered from the evocative smell of the biscuit. It is this example that is extensively used in published research to introduce and describe involuntary memory.

> I raised to my lips a spoonful of the tea in which I had soaked a morsel of cake. No sooner had the warm liquid mixed with the crumbs and touched my palate than a shiver ran through me and I stopped intent upon the extraordinary thing that was happening to me. An exquisite pleasure had invaded my senses, something isolated, detached, with no suggestion of its origin… I sensed that it was connected with the tea and the cake… And suddenly the memory revealed itself. The taste was that little crumb of madeleine which on Sunday morning at Combray when I went to say good morning to her in her bedroom, my aunt Léonie used to give me, dipping it first in her own cup of tea.
>
> (Proust, 1928, pp.60-63)

Here, Proust describes the nature of involuntary memory to be indefinable yet mysterious, randomly triggered through chance encounters with obstacles in the environment. He describes his experience of involuntary memory as it happens, where people come across an object and a lost sensation that thrills, but they are unable to give it a name. People have to tap into their own memory to remember specific details from their past where it is

not planned or predetermined but sporadic and elusive. It is a process needed to progress from one state to the next, having to step back into the past to be able to move forward. Leslie (2001) describes involuntary memory as lucid and pre-verbal, coupled with euphoria, saying: "Involuntary memory summons up, in one flash, the narrator's past or a past ready for narration, out of the blue. For Proust, involuntary memory is impromptu, bouncing off objects encountered randomly" (p.68). Sometimes experiences of involuntary memory can be described as being sudden and complete in a flash, whilst other times it can be more elusive, needing patience to discover. Benjamin further describes the influence of types of objects on memory recall, like souvenirs that have an awkward relationship to memory. As souvenirs are never a true representation of experience but a substitute, used to voluntarily elicit storytelling about the experience, Benjamin describes voluntary memory as never being a true memory. Salaman (1982), a novelist, remarks how involuntary memories are different to conscious memories. She discusses how only memories of events come back involuntarily, and are accompanied with intense emotions and a sense of revisiting a time in the past.

For a long time involuntary memory was not recognised as a distinct discipline in psychology with, until recently, little literature on the subject. Though this phenomenon existed and was described vaguely by Ebbinghaus (1885), identifying the differences between voluntary and involuntary memories in the opening pages of his book 'Memory: A Contribution to Experimental Psychology,' only recently have more defined definitions developed. Ebbinghaus highlighted voluntary recall as one which "can call back into consciousness by an exertion of the will directed to this purpose" from involuntary recall, which are mental states people return to "with apparent spontaneity and without any act of the will." In 1967, Neisser distinguished the striking differences between people's types of memories, saying "some thinking and remembering is deliberate, efficient and obviously goal-directed; it is usually experienced as self-controlled as well. Other mental activity is rich, chaotic and inefficient; it tends to be experienced involuntarily, it just 'happens'" (Neisser, 1967, p.297).

Since Neisser, involuntary memory has been referred to vaguely in terms of incidental memory (Baine, 1986; Masson & McDaniel, 1976), prospective remembering (Sellen et al., 1997), autobiographical memory (Cohen & Conway, 2009; Conway, 1990), social remembering (Cohen & Conway, 2009; Middleton & Edwards, 1990) and implicit and explicit memory (Smyth et al., 1994), with any specific mention of involuntary memory triggers often appearing in 'flash-bulb memory' research (Brown & Kulik, 1977; Neisser, 1967). In the last 20 years has there been more distinct writing about the subject

by psychologists, notably works by Mace (2007, 2006 and 2004), Mandler (2007) and Berntsen (2009, 1998 and 1996; Berntsen & Hall, 2004). The current understanding and processes around involuntary autobiographical memory, and those relevant to design, I examine later (see *Chapter 4*) but first I clarify the definition, characteristics and effects of involuntary memory.

Mandler (2007) succinctly defines the differences between voluntary and involuntary memory.

> Voluntary memories are those that are preceded by some conscious state that requires, addresses, or seeks the memory in question or some related memorial event. The thinking subject is not surprised by their occurrence, and they are normally internally/intra-physically generated. Involuntary memories are conscious products that are experienced, perceived, or identified as occurring without a prior state that intends them, seeks them, or is related to them, and usually they are not obviously related to immediately preceding conscious states. The thinking subject is surprised by their occurrence, and they are usually generated by external extra-psychic events. (Mandler, 2007, p.213)

Involuntary memories are more specific, positive and less rehearsed in comparison to voluntary memories (Berntsen & Hall, 2004; Berntsen, 1998), defining the uncontrollable, spontaneous nature of them as 'popping' into people's minds with no obvious retrieval attempt (Berntsen, 1996). To understand why this happens, researchers refer to 'chaining' (Mace, 2006 & 2005), where involuntary memories are activated by accessing a related memory first, 'state of attention' (Kvavilashvili & Mandler, 2004) where unfocused attention promotes elicit involuntary remembering, and the presence of triggers in the environment (Mace, 2007; Schlagman et al., 2007).

Involuntary remembering does not overwhelm people as concentration tasks halt involuntary memory production (Baddeley et al., 2009; Berntsen, 2009); instead they occur when a person is not in retrieval mode and not performing a demanding memory search (Ball, 2007). As involuntary memories are triggered by associated connections and not top-down heavy search processes, they are usually particular and specific, appearing as novel and emotionally engaging compared to voluntary memories (Berntsen, 2009). Salaman (1982) observes examples of involuntary memories as peculiarly vivid and emotional with a strong feeling of immediacy, and Thompson et al. (1996), Bradley et al. (1992) and Holmes (1970) found strong emotional memories to be more accessible, known as the 'intensity bias'. Proust describes their non-interrupted form of having not been recalled, often since their original encoding, where they have not been subject to reiterations and narrative build-up through retrospective reflections (Berntsen, 2009), as memories from voluntary remembering often have. This produces a feeling of preserved, fresh and strong emotional reliving.

Generally, experiences of involuntary remembering conjure up positive memories, but there may be occasions when these previously unbidden memories stir up traumatic and negative experiences, leading to post-traumatic stress disorder (Mace, 2007). The negative impact of involuntary memory is explored as a separate discipline (Mace, 2007; Berntsen & Rubin, 2002) and for my research traumatic involuntary remembering is less relevant. It is the positive and welcomed qualities of experiencing long-forgotten memories through involuntary remembering that I focus on.

Clues for design

Understanding involuntary memory through psychology research provides understanding of the conditions influencing this type of remembering. It also identifies the challenges faced when searching for ways design may assist; challenges such as delivering suitable memory triggers whilst maintaining unexpected recollection and ensuring they are presented in appropriate contexts. I now consider ways design might be able to do this.

Existing systems already rely on aspects of involuntary memory, such as schema theory, suggestion and subliminal cueing, and I now investigate these further alongside examples from complementary fields dealing with similar issues, such as conceptual art and social media projects. Looking at how other models encourage involuntary remembering helps towards developing new theories for design support, which I present later.

I use the practice work for this chapter to introduce new proposals to support unexpected remembering, which are presented alongside the 'clues'. The concepts highlight ideas explored and are discussed in relation to the issues and challenges raised in my literature review.

Clue 1: Importance of the trigger

The main research challenge is how to orchestrate episodes of involuntary remembering when, by their very nature, they are elusive and uncontrollable. The experiences Proust (1928) describes, show involuntary memories are heavily dependent on chance meetings with cues in the environment. A person has to stumble across a cue that hints towards authenticating a memory, tapping into the unconscious and transporting people back to remember the past.

Triggers are so important to cueing remembering that understanding the *type* of trigger is important. Some (Chu and Downes, 2000; Conway, 1990; Proust, 1928) argue that intangible cues contribute to more intense memories than those cued through material objects, and important to this research is distinguishing those powerful in spontaneous remembering. The construction of the situation and environment is important with intangible elements (Smyth et al., 1994), for example, sound, smell, temperature, helping to build the experience and influence a person's mood and state of mind (Tuan, 2001).

Music is often used to 'set-the-scene' and suggests implicit ways of thinking as well as explicitly triggering memories associated with a song. Music can be era-specific where people of similar ages may share experiences and memories around specific music. Similarly, sounds are unique to certain places where unexpected displacement of sound causes people to question context, and consequentially remember the original, for example, hearing a familiar mobile phone's ring-tone and unexpectedly recognising it from a TV programme watched as a child.

Smells and tastes also have this quality of impromptu remembering with the slightest hint of a distinctive smell or taste, especially one from childhood, often triggering unexpected remembering of the past. These childhood memories especially, trigger very intense memories (Smyth et al., 1994; Neisser, 1967) where intensity is heightened because they are the oldest and most forgotten memories. A person's concerns and ways of thinking might be quite different now compared to their childhood and fewer material possessions survive, so offer less chance of encountering 'physical' memory triggers. Therefore, for childhood memories, the immaterial triggers of smells, tastes and sounds are more likely to be effective, like the taste of sweets enjoyed as a child.

Though perhaps not as powerful in triggering involuntary memories as intangible memory triggers, physical triggers still have relevance to impromptu remembering. Imagine rediscovering long-forgotten memorabilia hidden in a box triggering involuntary remembering: the key is not having seen the object for a long time, where associated memories have laid dormant, making the experience special. Similarly, encountering objects at a car boot sale identical to those once owned, or inheriting other people's objects, cue other occasions where unexpected remembering occurs around objects.

Concluding, the types of triggers and length of time since last accessing the memory are important in creating powerful unexpected remembering, and should be a focus for supportive design proposals. Inspired by the importance of the trigger, my design concepts explore areas of the home memorabilia resides, showing how these spaces can be

enhanced. The main store area of the attic, and display area of the mantelpiece are the focus for these concepts.

The **Attic Periscope** (*Figure 41*) creates new access to the potential memory triggers hidden within the attic. The attic frequently triggers memories when accessed, where

Figure 41: Attic Periscope

Figure 42: Mantelpiece 101

finding new ways to enter this space under different conditions may offer new ways to cue memories. The periscope might offer fleeting glimpses of the attic's contents when passing by, or more in depth discovery if time allows. It also offers different perspectives to

memorabilia, restricted through the viewing angle and lens, and an inability to touch and move objects around for further examination.

The proposal suggests visitors to the house may access this private space; people who would rarely be given access to this memorabilia store. This proposal for making our personal histories public are discussed further in the next section, where the attic periscope concept is developed into a design exploration (see *Chapter 3: Public Personal Histories, Display Rodent*) which trials opening up this space into a permanent display.

Another concept exploring memorabilia in the home is **Mantelpiece 101** (*Figure 42*). Employing a voting system, the proposal allows members of the house to democratically decide on an object's future. As family members have different roles regarding the display of memorabilia, this concept encourages all family members to actively decide the fate of potential memory triggers. Placing an object on the mantelpiece signifies imminent eviction from the house as it begins its journey along a conveyor belt towards the bin, unless it is saved, by placing it back with its display companions.

Using a prominent display area of the home, the mantelpiece, the device changes the position of the items on this display, bringing memorabilia items back into the gaze of family members and potentially reinvigorating the object's ability to trigger memories. Perhaps if the object triggers a memory, members of the household may choose to move the object off the mantelpiece, thus saving it.

Overall, in this clue I consider the importance of cues in triggering personal memories. The ideas and proposals presented begin to show how such situations might invite people to unexpectedly re-experience potential triggers by offering new ways to interact with them. The proposals focus on personal memorabilia collections but there are times when other people's memory triggers cue personal remembering. I use the next clue to explore this and the spaces that promote public sharing of personal memories.

Clue 2: Public personal histories

Looking at other people's personal histories offers space to speculate, compare and contrast with our own, and in doing so often triggers our own remembering. Considering the impact of other people's personal histories show how existing databases of content, which do not belong to us, can still have personal resonance and trigger memories. This is important for this research and key in finding ways to encourage unexpected remembering, showing that designed systems do not have to rely on using a person's own content and memory triggers to affect purposeful reminiscing. There are many examples where other people's information causes personal reflection, which I now explore.

Services providing a social context for sharing memories already exist, for example, *Reminiscence Therapy* (Webster & Haight, 2002; Bender et al., 1998). Though reminiscence therapy was primarily developed for older people to talk about personal experiences from their past in a shared environment, it shows how remembering and sharing memories with peers promotes wellbeing, hence the term 'therapy'. Commonly bringing people together with objects from the era they grew up, the objects are used as triggers for remembering, resulting in sharing memories from the past. Of particular interest to design is how the principles of reminiscence therapy can be extended to provide services that are seen as personal, social and everyday opportunities, rather than therapies. Designers might consider different situations for presenting collections of objects, for example, retro toys on a display at the bus stop sparking off reminiscing with strangers.

A service offering similar qualities to this type of impromptu remembering is *Digital Storytelling* (BBC Wales, 2003; Lambert, 2002). Discussed in the previous chapter, it allows people to create short films of their memories, which are broadcast in public often to large audiences. As a service, it promotes sharing and preserving memories, with access to other people's memories creating opportunities for encountering our own unexpectedly. This also happens with social networking, 'blogging' websites and online diaries, which are used by many people on a daily basis and build a sense of communal memory and ownership amongst groups of users.

Explored earlier in relation to storytelling around memorabilia (see *Chapter 1: Practice Work*), car boot sales and second-hand shops offer similar opportunity to re-imagine personal memories through other people's memory evidence. These spaces present occasions for encountering our past through exploring other people's possessions, as their commodity value changes from memory-value to monetary-value (Gregson and Crewe, 2003; Appadurai, 1988; Kopytoff, 1988). Museum displays also hold this

potential, presenting cues to the past through groups of objects. For this research these spaces could be reconsidered and repurposed.

Some public displays of personal histories present extremes, provoking reaction and comparison to our own. Film and documentary offer 'windows' into other people's lives, occasionally highlighting extremes of memory, like *Eternal Sunshine of the Spotless Mind* (2004) and *Memento* (2000) showing memory's fallibility and precious nature. These films encourage viewers to consider life without 'normal' memory, leading them to appreciate what they often take for granted. Film also caters for a person's voyeuristic nature, where they might be keen to reaffirm life through comparison with other people. These channels for consuming other people's memories in the public domain extends through many facets of everyday life, with aspects seen in TV shows, films, art, social networking sites and newspapers.

A conceptual art project exploring the presentation of personal information in public is Lucy Kimbell's *LIX Index* (2003), which addresses living in a life-logged world. Based on the theory *'I measure, therefore I am,'* the LIX Index (*Figure 43*) measures and tracks the results of the artist's performance relating to emotional, physical, financial, spiritual, cultural, social and environmental factors. Similarly, artist Ellie Harrison (2002) recorded everything she ate for the year after her 22nd birthday for her *Eat 22* project (*Figure 44*), and Sophie Calle (Calle & Auster, 2007) displayed all the birthday gifts she received over a 14-year period, with a separate display case for each year (*Figure 45*). These projects show how an individual can be represented for public consumption.

Figure 43: LIX Index, Lucy Kimbell. Kimbell decided to measure her own performance by creating a weekly index of data about her.

Figure 44: Eat 22, Ellie Harrison. Harrison photographed everything she ate for a whole year. Eat 22 was the first of a wider series of 'data' collecting projects, recording details of her life.

Figure 45: The Birthday Ceremony, by Sophie Calle. Calle displayed elaborate cases of the birthday presents given to her throughout her life.

In response to audience demand for publicising more of a person's life, artist Josh Harris took sharing his personal life to the extreme. Harris filled his apartment with cameras and lived his life in public for months, where his life with his girlfriend was broadcast on the Internet and later made into documentary film *We Live In Public* (2009). To understand more about his viewers' reactions, their comments were broadcast back into his apartment where he could converse and respond. This project won prizes but had detrimental effect on his personal life and finances with his final decision that he could no longer live his life in public.

This project shows people engage with others who publicly share their personal lives, and elements of these can be found in new social media applications. *Highlight*, a social networking application (Vanhemert, 2013), supports aspects of publically sharing personal experiences by finding people located nearby in the real world who have similar things in common. The application opens up a continuous stream of information about a nearby stranger's personal life, bringing a digital service of consuming another person's data into a real-world scenario.

Other ways public databases of content become meaningful to an individual can be seen with user-generated content design where people contribute and generate content to public systems (Armstrong & Stojmirovic, 2011). There is a shift towards user-generated content as movements such as the *Quantified Self* (Wolf, 2010), *Open Source* (Open Source Initiative, 2012) and *Copyleft* (Armstrong & Stojmirovic, 2011) encourage people, through technological developments, to participate in developing and creating data.

Encouraging networked co-creativity, websites such as *Flickr*, *YouTube* and *Etsy* rely on people producing content to share in the public domain. These websites demonstrate ease for people contributing to shared public databases, but also show how people happily consume and value other people's information. When I consider people frequently engaging in other people's public personal histories, as described above, the characteristics of this method could be applied further when designing new memory support systems. I now discuss these characteristics and how they might be used through proposals.

Curiosity of people

People can be curious of other people's life stories, where peeking into another person's life provides opportunity to compare and contrast with their own. This reaffirming process encourages people to encounter their past and can lead to unexpected remembering. People's intrigue towards other people's lives supports further exploration of this method by using other people's publically available personal content to access our own memories.

Consumers of public personal histories

People already contribute content to vast public online databases, for example, *Facebook*, *Flickr*, *YouTube*. As a result, people become everyday consumers of other people's information, which can cause reflective moments and makes people adept at understanding connections with other people's personal data. Understanding how people can trigger personal memories from other people's information is encouraging for designers of memory support systems and should be explored further.

Resource value of shared memories

There is 'value' to memories shared and experienced, as other people's life history becomes key to triggering our own memories. As channels for publicly exploring other people's life already exist, how this type of information might be re-appropriated and consumed in different situations is worth exploring. Utilising public databases of personal information further offers opportunity, though methods for tuning and focusing these to a personal level is key. Ultimately, the positive benefits of using these databases are that

they negate the need for a person to contribute, maintain and access their own personal database of memory triggers; a key driver this research supports.

Design exploration: Display Rodent

To explore the themes around impersonal content cueing personal remembering, I developed the **Attic Periscope** concept further (see *Chapter 3: Importance of the Trigger*), into a prototype to explore what might happen with such a system in place. The **Display Rodent** creates new displays out of the previously un-displayed with a 'video camera-on-wheels' moving randomly around the attic on a purpose built device, transmitting 'live' images back to a central display screen (*Figures 46*) in the most used room of the house. Through building and living with the device, the Display Rodent (*Figure 47-50*) establishes new spaces for the social exchange of memories by rediscovering long-forgotten objects in the attic and offering public access to this usually private space.

The development of Display Rodent was influenced by Gaver's (2005) Video Window, where he displayed images from a camera mounted high outside his bedroom window to a screen on the wall in his bedroom, reporting on the appeal of living with the system and the experience it offers. Keen to explore the potential of opening up the attic space, I embarked on a similar process of crafting a physical version of the attic periscope to allow exploration, reflection and response to this research's emerging insights and themes around cueing our own remembering through other people's evidence of memories. Could opening up the attic space offer this opportunity to visitors to my house?

Building and testing the Display Rodent

The Display Rodent was built from readily available components that required relatively simple configuration and programming, allowing for quick prototyping where less concern went on the aesthetics of the device and more time on the programming and practicalities of transmitting a constantly changing live video from the attic to a display in another part of the house.

I decided to prototype Display Rodent using *Lego Mindstorms* and constructed a robust 'vehicle' on which I mounted a video camera. The construction of the vehicle enabled the video camera to be securely housed and was big enough to stop it getting caught in small spaces. The camera output was wired directly to a small display in the most used room of my house, the kitchen/dining room, and whilst the picture quality wasn't the best, the live feed offered clear images of the contents of the attic.

Figure 46: Display Rodent

Figure 47:
Display Rodent prototype moving around attic

Figure 48:
View of attic content from Display Rodent

Figure 49:
Display Rodent prototype

Figure 50:
Images from Display Rodent's camera viewed on screen in 'public' space of the house

During its first iteration, I programmed the device to rotate 360 degrees from a fixed point in the centre of the attic. After living with this configuration for a week, although it offered a clear view of different corners of the attic, the images became too predictable and lost the feel of rediscovering the long forgotten memories in the attic I was trying to build on. I decided to play with the programming ability of the device to explore displaying more unusual angles and perspectives, resulting in later revisions of the device moving more freely around the attic: forward, and when bumping into obstacles, reversing, pausing and moving off again at a different angle. Reaching this stage required many adjustments to the length of pause and viewing angle to ensure the images fed to the display offered some degree of intrigue and value. In the end, the length of the pause was determined by my experience of appreciating a different view on the display every hour or so, but this took a while of living with different pause lengths to decide upon my final preference.

In addition to these programming decisions, the device demanded other practical requirements, for example, the light in the attic needed to be left on permanently, parts of the attic needed to be rearranged to open up floor space for the device to roam, and a series of eyelet feeds were needed on the apex of the roof to stop the camera output lead getting caught whilst it roamed. Also, I had to make provision to drop this same lead from the attic opening two floors up, through the centre of the house, to the display in the kitchen.

Indeed, the camera output lead proved the biggest obstacle to the success of the Display Rodent as it demanded frequent maintenance trips back into the attic to free it from objects it became tangled with whilst moving about. This problem often resulted in the display showing 'stuck' images, sometimes for many days when it was inconvenient or tiresome to rectify immediately[6]. It seemed when I missed seeing new images from the attic I would make the effort to pull the loft ladders down and fix the problem. After these many adjustments to the Display Rodent, I lived with the system for a few months and reflected upon the experience.

Living with the Display Rodent

Due to the display for the Display Rodent being in the most used room of the house, it was seen frequently throughout the day. Though this was novel to begin with, because I knew the contents of the attic, over time I found myself looking at the display far less as the

[6] Gaver (2005) reflects upon the maintenance of a system being a chore when discussing building and living with his Video Window. He remarks how 'tinkering' with a system to achieve a desirable outcome can be rewarding and enjoyable but periodic maintenance and readjustment to fix problems often becomes a chore.

images became less surprising and intriguing. Instead, I became more intrigued by other people's reactions to the system.

Important to development was using the comments from family and visitors to the house to change the way the device moved. These comments encouraged me to make adjustments to the programming of the way the device moved resulting in it moving more freely and randomly around the attic, randomly pausing for different lengths of time and occasionally changing camera angle. When there was particular interest in the original boxes from my old childhood toys, I re-programmed the device (and moved large objects to keep the device in one area) to stay in that vicinity for longer. I enjoyed a week of reminiscing over my childhood with a few other people, but when this became tiresome I made adjustments to the device and it moved into another area.

The ability to reflect upon current location and change this when I wanted to led to many moments of playing and tinkering with the device. This interaction would often lead to moments of intense reminiscing when memory triggers were rediscovered, of course akin to entering the attic in the more conventional way, followed by days of less frequent interaction with rare and occasional glances at the screen and far less interrogation of the images displayed.

Over the months, the system offered many different images and unusual perspectives of the contents of the attic. I thought seeing the contents of the attic through a permanent display, and offering easy access to potential memory triggers, would cue many welcomed episodes of personal reminiscing for myself. Initially this was the case, with similar experiences to rummaging through the attic by conventional means, but after a few weeks the novelty wore off which I think would be expected. As with a photograph on display, over time it becomes noticed less, so I am not surprised that the images from the Display Rodent became less intriguing. I found this not to be a problem as after this time, the change in value of the system became clear when I had visitors to the house.

The engagement of visitors with the system was considerable. They became the instigators of tinkering with programming to explore deeper the undiscovered parts of the attic not yet seen, they also sparked conversations around reminiscing of the past where seeing my possessions viewed on the display invited interrogation over associated memories. The latter showed how powerful other people's evidence of memories is to cueing our own, where many new memories arose through conversing over our different experiences of owning similar items.

Building and living with the Display Rodent showed how such a system can offer and invite space for the social exchange of memories. Visitors to the house instantly

began conversation around the images displayed and over time, it was clear that the system was less of a reminiscing tool for me, and more fascinating and exciting to visitors. Living with Display Rodent identified people's inquisitive nature as they relished the chance to reminisce over objects discovered in this usually private space and shows value in exploring the use of impersonal content to cue personal remembering further.

This clue considers the value of sharing *personal memory information in public spaces* and how sharing and receiving other people's personal data can act as a catalyst in cueing our own memories. With consideration for supporting unexpected remembering, there are three lessons to take forward. Firstly, people are curious of other people's life stories where delving into these often cause our own memories to be triggered through comparison and reflection. Secondly, people are already consumers of, and contributors to, public personal histories through existing online databases, and these can be enhanced further to encourage more instances of unexpected remembering. And finally, using other people's information as a trigger our own memories highlights its resource value.

The examples show interaction with existing stores of public personal information provide opportunities to access memories. Although people are able to make personal connections from public databases of information, finding relevant and meaningful content from these vast stores can be hit or miss. I use the next clue to find ways existing databases of public impersonal information can be whittled down systematically to extract and direct more meaningful content towards the individual.

Clue 3: Schema theory

Schema theory, a concept developed in psychology (Bartlett, 1932), describes how people build understanding of the world by forming frameworks of mental structures that constantly challenge and adapt to new information, in order to learn and keep it in memory. Applying this, schema theory offers inspiration for how designers might make assumptions about someone's memories from basic understanding of their actions, habits and behaviours. Background knowledge of a person, for example, where they've lived, worked, studied and their family life can provide enough information to create understanding of their general memory scripts and schemas.

Schemas: Imposing order on memory

Bartlett introduced the idea of schemas to explain why, when people remember stories, they leave some details out whilst introducing rationalisations and distortions; reconstructing the story to make more sense in terms of their own knowledge and experience. According to Bartlett, the story is "assimilated" to pre-stored schemas based on prior knowledge. Brewer and Treyens (1981) note bizarre objects that do not fit a schema, are often recalled frequently and act a good memory triggers: it is the schema that creates the mechanism for identifying something as novel or unusual in the first place. For example, a person may remember there was a phone in an office room because they saw it, but may describe it as being on the desk because of where they expect it to be, when in fact it was on the windowsill.

> "A schema is a knowledge structure or a cognitive structure that organises information, and thereby influences how we perceive and respond to further information about objects, people and events. In other words, we impose order on experiences derived from recurrences of similar qualities across repeated events." (Wilderdom, 2003, p.1)

Designers could consider aspects of schema theory and 'making assumptions' about people as inspiration for designing support, where information known might allow them to 'assume' a person's future behaviour, choices and outcomes.

Conceptual artist Lee Gainer (2009), illustrated preconceptions of how people fit into certain schemas through his work '2 months' salary' (*Figure 51*). The project presented posters of engagement rings relating to the relative monetary value of the rings and average salaries of different jobs. The project developed around how advertising places people into schemas, based on "unwritten rules, hidden messages, ideas and beliefs that many people know and live by" (Gainer, 2009).

Though scientific experiments (Wilderdom, 2003; Brewer & Treyens, 1981; Markus, 1977) explore schema theory and its psychological effect on how people remember, the work of artist Sophie Calle demonstrates these ideas. She applies understanding of schemas, intentionally or not, to the context of people's reactions to a piece of art (Schacter, 1997). Working with museum personnel, Calle asks what they remember from art on display at the museum, hung in the gallery where these people work. She found different people retain and recollect different aspects of their everyday environment, based on their schemas. Some recollections describe the content of the picture, like colour and hues, while others describe the dimensions of the frame or the scene. Two people can have different recollections of the same event and this example

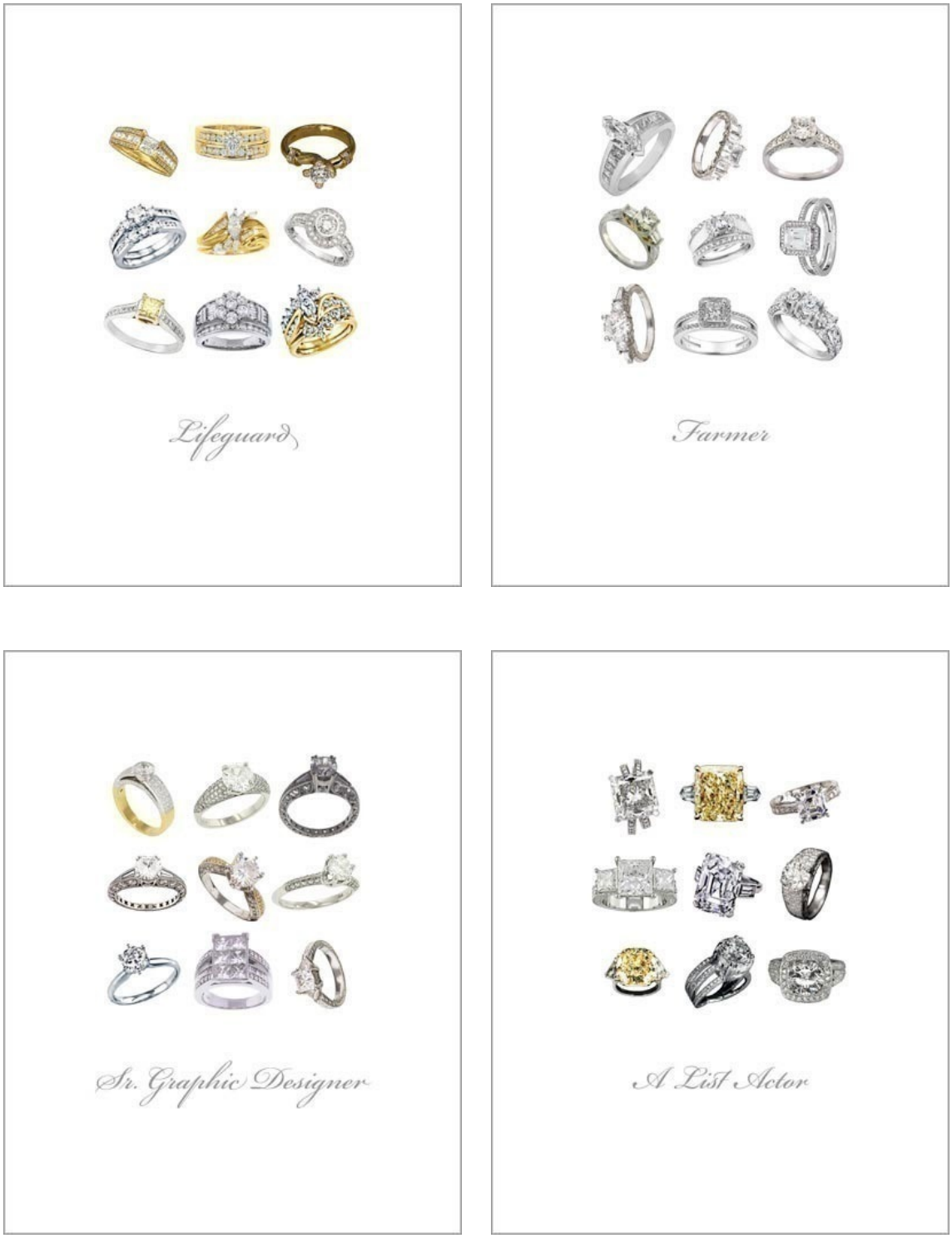

Figure 51: 2 Months Salary, Lee Gainer. Comparing the relative monetary value of engagement rings with affordability based on average salaries of different professions.

from Calle shows how people act as a filter; the filter adjusting, like a camera lens, to give a different view and perspective of the same event.

Understanding that people organise memories through creating scripts and schemas, for design, schema theory might inspire ways of predicting situations and experiences. Websites commonly use algorithms to 'guess' information relevant to the current user based on previous search histories and current location. Known as the *Filter Bubble*, Pariser (Parramore & Pariser, 2010) explains the concept as a "personal ecosystem of information that's been catered by these algorithms". Applying this concept, new memory support systems could be designed around situations that predict someone's memories through making assumptions based on habits, behaviour and lifestyle. Applied examples include the search facility on *Facebook* (2012), where users can find old school and work colleagues through the system suggesting searches for people with a similar past (*Figure 52*). Another application, *Spotibot* (2012) for music database Spotify, supports elements of unexpected remembering as new music is suggested based on what people have listened to in the past, recommendations from friends, or listening habits of similar Spotify users (*Figure 53*).

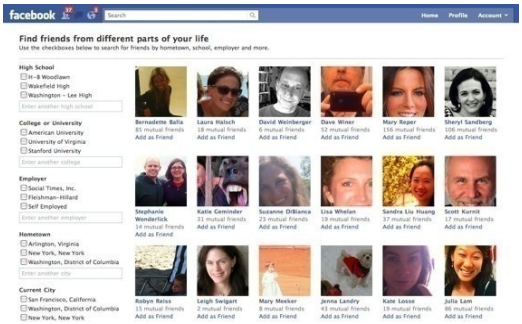

Figure 52: Facebook search facility looks for people with a similar past to suggest potential 'friends'.

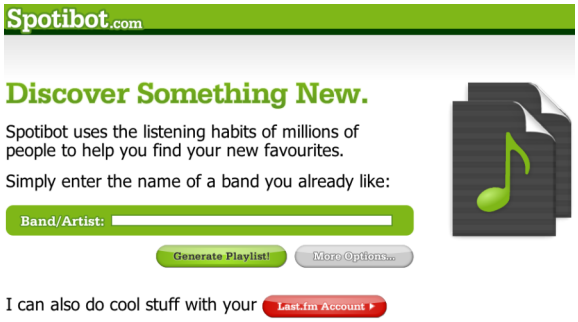

Figure 53: Spotibot application for Spotify creates a playlist based on users with similar preferences and music habits.

More examples of *Schema Theory* come from looking at 'routines', where over time a system might 'learn' about a person by wearing sensors that record environmental conditions and map patterns. Existing projects, like *MyLifeBits* (Gemmell et al., 2006), *What Was I Thinking* (Vemuri & Bender, 2004) and *Remembrance Agent* (Rhodes & Starner, 1996), already offer opportunity for collecting information from daily activity and this data could be used to make assumptions about a person; they are likely to be in *this* place at *this* time every weekday and would be receptive to taking in *this* type of information. Understanding where people are and the context they are in on a regular basis could help in finding suitable moments for presenting reminiscing support.

Another consideration is *stereotypes,* and how they develop by making assumptions on a person's habits and behaviours (Araya, 2003). When one aspect of a stereotype is brought to mind people often assume other aspects of a person's behaviour as pre-stored knowledge based on personal assumptions fill in the gaps. This would need further investigation but it could offer categorization and informed assumptions about people, based on their physical and behavioural differences.

Understood through schema theory, and by considering stereotypes too, generalised assumptions could be made that people around the same age with the similar interests might have similar memory triggers (Wilderdom, 2003; Brewer & Treyens, 1981; Markus, 1977). It may even be possible to suggest what some of these memories might be when referring back to pre-stored 'system' knowledge of their particular stereotyped group. If this is true, people may fit into groups where fed the same impersonal content (which they do not own) they are likely to have an existing relationship and potentially trigger a memory. Applying this could see boxes of era-specific objects, as seen with *reminiscence therapy*, used by people of all ages, where box contents are chosen depending on the 'systems' understanding of a person's schemas and scripts.

As life stages see people experience certain events, for example, graduating from school, getting married, having children and retiring, they also see people encode very specific memories. With basic knowledge gained of a person having experienced a life stage and when (perhaps through collecting information from publicly available databases), speculation could be made that popular music from that time or important news events are likely to trigger memories. Important here are the common memories shared by people, those that everyone might find personally meaningful and interpret.

I explore these ideas further in my own design. **Ebay Frame** (*Figure 54*) uses an external database of existing content to display audience-relevant images of objects currently selling on the eBay website. Designed to provide background prompts to memories, Ebay frame can be extended to test era specific content, where the system makes assumptions on information relevant to key events in a person's life, for example, school disco music, based on the age of the people in the room.

The concept uses the Ebay website as it is a very good example of an existing database of categorised objects. The website requires users to categorise and filter objects into groups, for example 'retro toys' and '1960's clothing', which works well with this concept's requirements. The images of objects currently for sale, matching the filter on the

Figure 54: Ebay Frame

frame, are displayed in anticipation they may trigger memories from the people in the room. Streaming this type of content to the frame attempts to provoke a reaction; hung on a wall in a shared space, it offers background information that can be acted upon or ignored by people in the room. There are situations where seeing an image in the periphery triggers a memory, encouraging reminiscing with people in the room. Ebay frame proposes impersonal content, in this case photographs taken by strangers to sell their possessions, can trigger other people's personal memories.

Through this clue, I propose that designers might use schema theory for inspiration to understand basic information about a person and help direct and filter impersonal content in relevant and meaningful ways. Using available information about an individual, and allowing a system to make guided assumptions, designers may be able to orchestrate the presentation of potential memory triggers in unexpected and welcomed ways. The challenge with making assumptions about someone's potential memories in this way is not only about getting the assumptions correct, but delivering them in a way that is sympathetic and appreciated, and not considered intrusive or bizarre. The next set of clues draw on existing processes presenting personal memory information unexpectedly and sometimes unknowingly. In the next clue, I consider subliminal messaging and the value of receiving information at the threshold of consciousness.

Clue 4: Subliminal messaging

Subliminal perception exists below the threshold of consciousness where people are unaware of taking in information and unable to process it consciously. The effects of subliminal stimuli on a person's actions are nothing more than a short-term fleeting effect on current thinking, potentially causing people to change behaviour of what they are doing here and now (Merikle, 2000). For new memory support systems, designing subliminal stimuli interventions could induce further moments of unexpected remembering, where people are fed information involuntarily.

To understand how subliminal interventions might positively support unexpected remembering, I first consider the way it is often misused. Ethically it is wrong to feed information to a person when they are unaware, and subliminal advertising has been used to encourage consumer spending and change people's opinions with huge consequences and legal issues, hence it is banned in the media (Straubhaar et al., 2012). However, the

process of feeding information to the sub-conscious satisfies the need of this research to support remembering in unexpected ways.

Conceptual designers Penny & Tozzi (Penny, Personal communication, 2007) explore this through the *Subliminal Flash Camera* (*Figure 55*). The concept uses a camera flash to randomly trigger an instant imprint of an image or word onto a person's retina, subliminally sending a message that can be reflected upon at some point in the future.

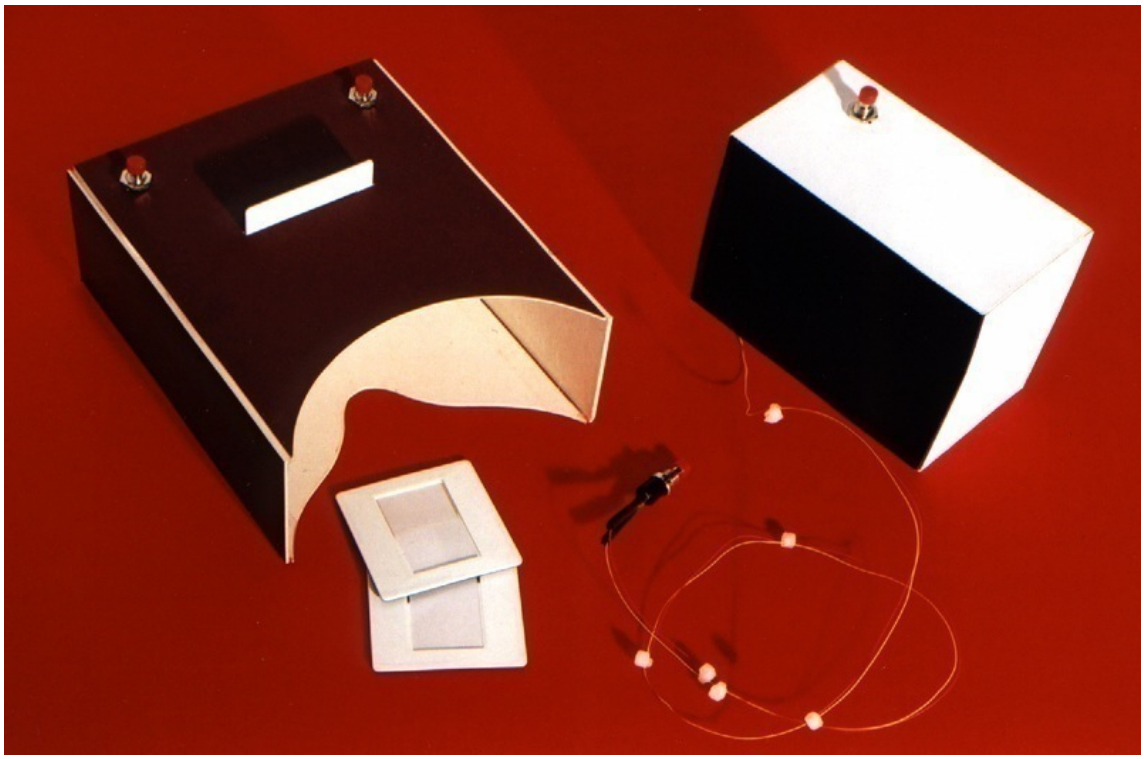

Figure 55: Subliminal Flash Camera, by Penny & Tozzi, imprints an image or word onto a person's retina where it may be subliminally reflected upon in the future.

As well as conceptual design projects, commercially available software exists designed to organise and manage sending subliminal messages (see *Figures 56-57*). *Subliminal Messages Organizer* (Subliminal Messages, 2012) and *Subliminal Messages Hypno Flash* (Subliminal Messages Forum, 2011) encourage users to make changes in their lives and improve self-confidence through self-hypnosis. The software tools allow people to create and organise messages, sending them subliminally whilst working at the computer.

Although subliminal messaging may be loaded with moral and ethical issues around its potentially persuasive and influential ability on human action, I take a slightly different angle by considering the continuum between conscious and unconscious perception, and particularly how people use elements of subliminal stimuli when they take

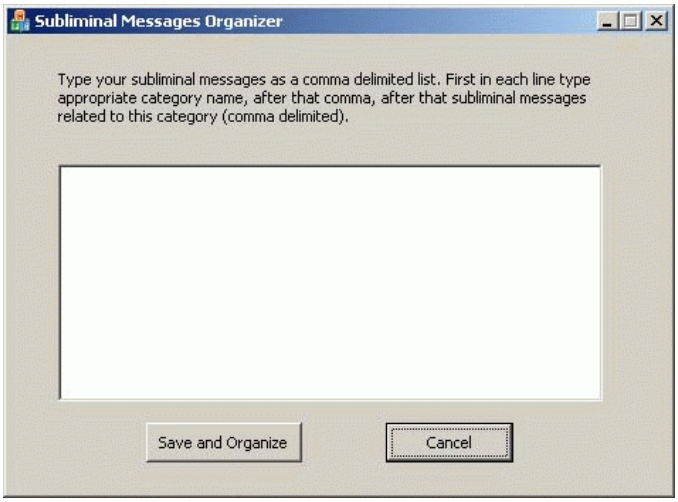

Figure 56: Subliminal Messages Organizer is a software program marketed for its potential in making changes and improvements in people's lives.

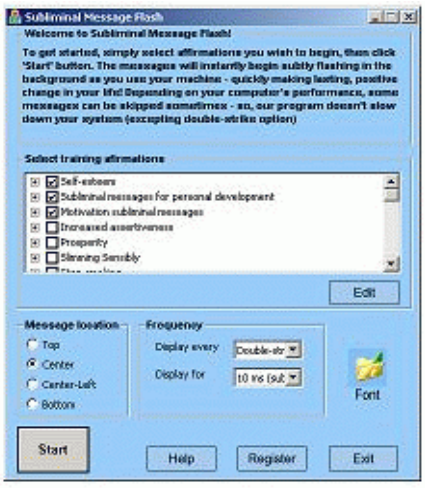

Figure 57: Hypno Flash flashes unobtrusive messages around the the computer monitor.

in information from their periphery. Peripheral cues have qualities of subliminal stimuli but people remain fully conscious and aware of them. Brown and Duguid (1996) discuss how "well-designed media provide peripheral cues that subtly direct users along particular interpretive paths by invoking social and cultural understandings". Their aim is not for cues to become the focus of current activity, but to be used subtly to guide and provide reassurance, offering additional information to the current task.

In this research, peripheral cues can provide supportive information and subtle hints towards memories. Considering situations where people seek out peripheral clues for additional information may suggest spaces for design, where interventions are not seen as a direct invasion of current activity. One example of this is same-time sharing applications, like messenger and chat rooms, where people share knowledge ad hoc. These applications allow conversations to appear unexpectedly on screen, though instant sharing in this way may fail to take into account current context. It may by inappropriate to be suddenly reminded of past memories whilst working, and there should be relevance to current context for peripheral cueing to be welcomed and not seen as disparate, intrusive and annoying.

Daydreaming is another example of unexpected remembering (Berntsen, 2007) where the brain is working constantly during resting states. Certain conditions encourage daydreams when focus within the environment fades and the mind is able to drift (Mazoyer et al., 2001) and this is useful for design as interventions could be orchestrated during restful and repetitive tasks. Sending and suggesting information in the periphery, aimed at triggering memories involuntarily during these states, could prove successful.

Subliminal messaging is a powerful tool for unexpected remembering, but there are many issues over whether this should be done when a person is unaware. The boundaries of acceptable interventions are worth exploring further as a system discreetly feeding personal memory triggers in a timely and positive way may well trigger positive experiences of unexpected remembering. I investigate the potential of subliminal and peripheral stimuli in my design work. The concept **Periphery Phone** (*Figure 58*) considers people talking on the telephone, having their eyes free to 'wander' and take in additional information. In this state, images could be fed into the environment onto nearby displays to potentially influence conversation.

Similar to how people doodle on a notepad whilst on the phone, this space is ripe for exploration whilst they are in this daydream state. Other situations to consider are travelling on a train looking out of the window, watching a screen and seeing movement in the periphery, or waiting and visually exploring the surroundings. Many of these produce daydreaming states that could be explored further to encourage unexpected remembering.

This clue considers how a person's state of mind, and the situations that promote taking in peripheral information, can support elements of involuntary remembering. Though the ethics around subliminal messaging discourage using it as a direct method for supporting unexpected remembering, aspects of peripheral cueing certainly suggest spaces and situations suitable for further exploration, as shown in the design proposal. Considering designing specifically for tedious repetitive tasks, when the mind is able to drift away from current activity, situations suitable for feeding peripheral cues and suggestions become apparent. I develop some of these themes around peripheral cueing in the next clue, as I consider the power of *suggestion* as an approach for encouraging involuntary remembering.

Figure 58: Periphery Phone

Clue 5: Suggestion

When designing memory support, whether an object, product or system, it is not the support that contains the memory, but the people. The support simply needs to be the trigger to those memories and not the repositories. Understanding this is important and gives scope for designers as they no longer have to design systems around personal content, alleviating the need for individuals to contribute, update and retrieve content to or from a system.

Research shows (Berntsen, 2009; Mace, 2007) only the slightest hint of a memory cue is needed to trigger rich reminiscing experiences hence evidence of the whole memory does not need to be transcribed and recorded for posterity. Memory information recorded in its entirety affords remembering that is more fixed and less dynamic, in contrast to just hinting towards a memory. Perhaps the mistake of designing memory support systems in the past has been an emphasis on capturing more of the evidence of the memory through the support, when we should capture less. Capturing less encourages people to add to and update the information, where memories can evolve and take on more information each time they are accessed, and is in support of how people naturally remember.

Many technology researchers and commentators (Buxton, 2007; Dourish, 2004; Gaver et al., 2003; Jeremijenko, 2000) support proposals similar to 'suggestion' as they promote simplicity, underrepresentation and ambiguity in new technology systems. Designing systems that suggest and hint create ambiguity around objects and instances, forcing people to think around and imagine the rest (McCarthy & Wright, 2007; Gaver et al., 2003). By not having the full picture, especially with information associated with memories, people attempt to fill in the gaps else question what is missing often using their own experiences to make sense. Ambiguous systems allow speculation and imagination by encouraging people to explore the subject and create spaces to unexpectedly remember. Brown and Duguid (1996) claim this leads to more successful interaction and understanding.

> The future of design in information technologies lies not in developing means of increasingly full re-presentation, but rather in allowing increasing amounts to be underrepresented; not by increasing what is said, but rather by helping people to leave more unsaid; not in refining abstractions, but rather by making use of their inevitable impurity; not by making more explicit, but rather, by leaving as much as possible implicit, and in the process keeping things simple. (Brown and Duguid, 1996, p.129)

Designers can use the power of people's imagination to make sense of impersonal information, based on personal reference and experience. Presenting abstract impersonal content, and people's ability to make sense and connections to this information through accessing their own memories is key to this research.

Another concept from designers Penny & Tozzi (Penny, Personal communication, 2007), the *Secrets Camera* (*Figure 59*) illustrates these ideas. The concept displays a 'secret' to the audience, inviting reaction and reflection upon what is displayed. The content, extreme and bizarre, provokes people to make connections with personal understanding around the subject. Consider how people make connections to this type of information in real-world situations, for example, composite pictures combining images from different sources to build layers and produce convincing pictures that cause people to 'feel' they know the image. Where composite pictures work well, people begin to question the familiar but in its new, unusual context. Of relevance is how using familiar images of people and objects, and re-issuing them in a new format, encourages accessing and remembering the memory in a newly experienced way.

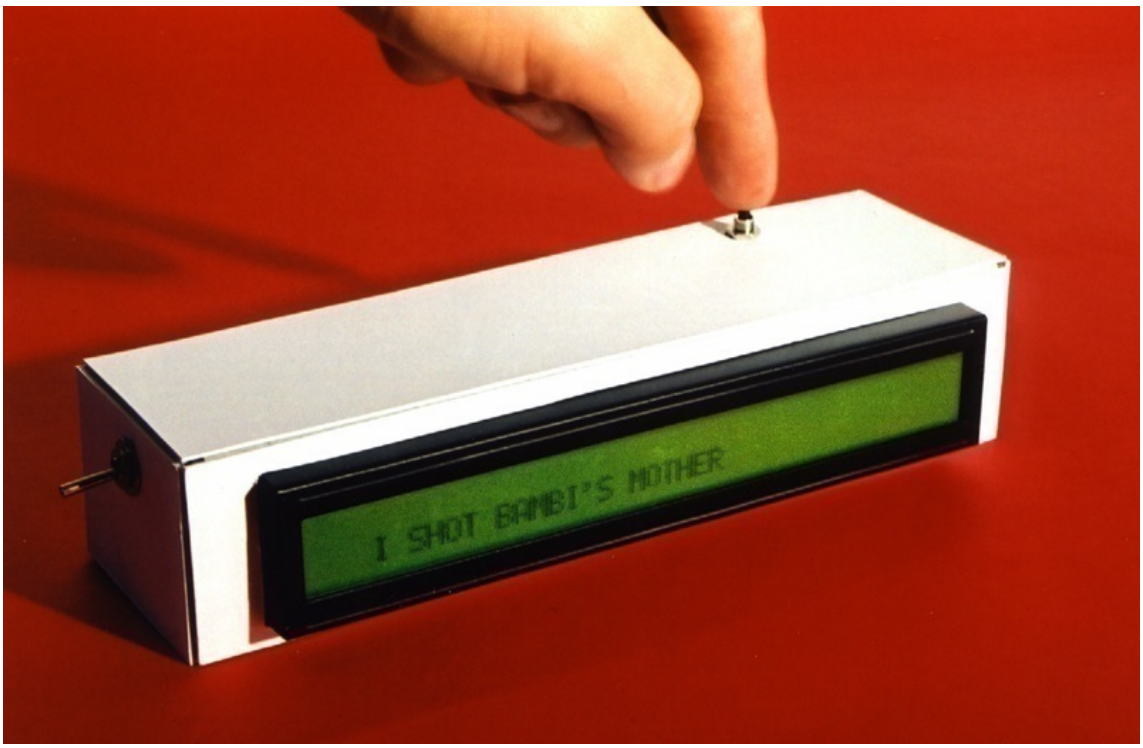

Figure 59: Secrets Camera, by Penny & Tozzi, displays a 'secret' to people, inviting them to reflect and react upon what is being displayed.

Figure 60: Photomontage of world landmarks, a composite photo of many images joined together creating an 'illusion of an unreal subject'. (Source: //commons.wikimedia.org/wiki/User:Mmxx)

Seeing well-known landmarks of the world together, as one photograph (*Figure 60*), brings familiarity from landmark recognition alongside questioning of their presentation together. Though the viewer understands this as a composite picture due to prior knowledge of landmark locations, presenting them in this composition offers a new way to access any associated memories.

Projective tests, used in psychology, are another example where ambiguity is used to encourage and stimulate interpretation. The *Thematic Apperception Test* (Gieser & Stein, 1999) asks individuals to interpret ambiguous scenes and tell stories around them, whereas *Rorschach tests* use inkblots to understand a person's interpretation and perception of the abstract images presented (Exner, 2002). During the tests, results are analysed by psychologists to understand more about personal characteristics and emotions, based on a person's answers. Of relevance is how projective tests demonstrate a person's ability to interpret random and abstract information guided from personal experiences. These examples show presenting people with abstract impersonal information has the potential to cue involuntary remembering, given the right situation and encouragement.

Evidence of using 'suggested' information for reflection is found in the work of artist Joseph Cornell. Creating boxes of "visual poems" (Sommers & Drake, 2006) from found objects, collections of ideas and memories are encouraged through placing certain groups within each box (*Figures 61-62*). Cornell uses objects people can see to suggest things people cannot see, hinting at ideas, memories, fantasies and dreams. Known as a symbolist, he uses found objects as suggestive hints to more abstract ideas, encouraging the viewer to explore and suggest what the connections might be between the objects.

Figure 61: Cockatoo with Watch Faces Box

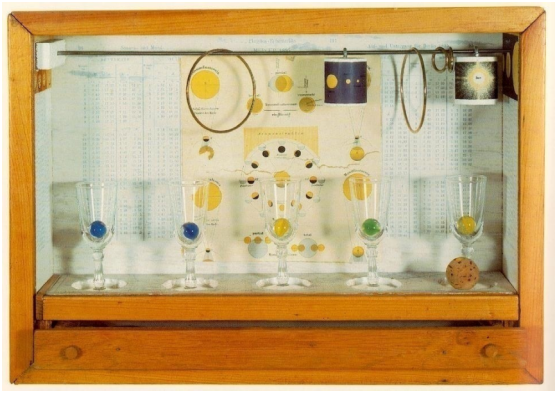

Figure 62: Solar Set Box

Joseph Cornell created glass-fronted boxes containing mysterious collections of objects in various groupings, formed to illustrate poetic stories and associations for audience reflection.

I explore the themes around *suggestion* through my design concepts *Letterbox Scanner* and *Room Camera*. Both proposals consider how 'hints' might encourage people to rediscover memories by making connections to their past.

The first concept, **Letterbox Scanner** (*Figure 63*), searches items posted through the home letterbox for their place of origin. The origin is identified through the town or city on the postmark and is displayed on the back of the door, offering opportunities to remember specific post, the people and places directly associated, as well as those indirectly linked.

Occasionally, places could appear triggering memories totally unconnected to the contents of the post received, but form links to memorable people or events. The location of the display offers quick glimpses to place names, perhaps a glancing view on the way out of the house setting up remembering episodes on the start of a journey where travelling provides opportunity for day-dreaming and imagining.

The next concept, **Room Camera** (*Figure 64*), leaves traces and suggestions of the past in the domestic setting. A camera attached to a ceiling light, takes time-lapse images of the room from above where overview pictures show object outlines that fade over time, the fading showing movement and the presence of both people and objects in the space. The abstract representation and fading provides opportunity to remember objects and people, encouraging reflection over what has happened in the space in the recent past. The concept could be extended to offer the display in a remote setting, giving a 'window' into domestic activity and reminders of the past.

Figure 63: Letterbox Scanner

Figure 64: Room Camera

The power of suggestion provides unexpected spaces for people to consider, access and reflect upon their memories. Using suggestion methods to hint and suggest possible scenarios and situations, people can be encouraged to fill in missing gaps of information with their own understanding of the information presented. Designing a system based on suggestion and under-representation to trigger personal memories successfully counteracts the need to know detailed accounts of people's memories, where instead, designed support can nod towards a memory, spurring people on to fill in the missing information.

Clue 6: False memories and rumours

The previous clue hints at making sense of information that is impersonal and abstract, but there are times when suggestion can lead to people creating entirely false memories. In the past, false memories and rumours have been explored negatively, seen as wrong and detrimental to personal wellbeing, but what if false memories could be used positively, through design interventions that use understanding of how they occur to inspire new ways to access our memories?

Research by Loftus and Calvin (2001) shows memory is highly suggestible especially when a credible source suggests and reinforces information, emphasizing its existence. A more plausible way of considering false speculation might be through rumours and hoaxes. False memories rely on first person accounts but rumours and hoaxes are different: rumours are unverified accounts, often with less-credible sources and instead built on acceptance through person-to-person circulation.

Artist Alasdair Hopwood and the Anomalistic Psychology Research Unit at Goldsmiths collect accounts of false memories from the public to create the *False Memory Archive* (*Figure 65*). This archive, a website, is used to inspire a touring exhibition exploring the scientific enquiry around the subject through new works that 'reflect upon what kind of *truth* can be revealed by a false memory' (Wellcome Trust, 2013).

Figure 65: False Memory Archive, by Alasdair Hopwood, is an art project collaboration with scientific researchers to explore the phenomenon of false memory.

The archive inspired Hopwood to develop associated works, for example, a film of a balloon ride made with a camera for amnesiacs, and a collection of minute-long recordings from 'the end of the world.' These works attempt to create accessible narrative and discussion around the topic of false memories, highlighting the malleability of human memory where the subtlest of cues can lead people to imagine entire events.

Presenting evidence encourages acceptance of a false memory being 'true' where people have less reason to question it, if it comes from a credible source. Newspapers are a good example of this where articles supported by quotes and statistics from regulated and authoritative bodies hold credence through association. Journalism, however, has its own issues around presenting objective coverage of information as a false balance of facts can push people to unfairly, and perhaps falsely, believe. This identifies deliberately introducing false memories through newly designed systems raises ethical dilemmas. Rumours on the other hand, could be used in a more lightweight and positive way.

Introducing rumours could beneficially encourage people to access their memories. People questioning a rumour, if done carefully and considerately, could create unexpected moments of re-visiting the past. Often referred to in terms of misinformation (wrong information rather than deliberately false information), rumours have the quality and potential to cause people to doubt what they know to be true and false, requiring judgment on whether they believe the rumour or not (Vis, 2012; Procter et al., 2011). For design, rumours have the potential to be casual and fanciful, a take-it or leave-it attitude that may cause people to stop and question, but use their own pre-existing knowledge to believe and act upon it.

I explore the themes around false memories, and introducing suggestions and rumours, in the concept **False photo frame** (*Figure 66*). The concept places a digital photo frame in the home, accessible to all family members and visitors, and displays composite pictures created from the family's digital photo collection. The compiled images use elements from one photo composed against parts from another, producing a feeling of familiarity as well as questioning the mis-information presented.

Whilst a digital photo frame that changes photos frequently and randomly already promotes unexpected remembering, extending this to suggest 'wrong' memories through composite pictures enhances this. People may recognise a photo as belonging to them but may have to interrogate their memories to fully understand the composition. As a result, these photos require more effort to understand associated memories, where the act of doing so and proving the image wrong, forces people to spend more time reminiscing.

This concept could be extended to link meaningful dates, people or places to the composite picture displayed. Related images might be taken from other online databases creating a collage of visual prompts, some from personal memory archives interspersed with public data. Consider a personal photograph from a city break forming a composite picture with an image from a news report on the same place, and the memories this may trigger. Or other people's photographs from places visited displayed on the frame on significant anniversaries. There are many ways 'false' images presented through this display could extend aspects of involuntary remembering.

Understanding the scientific theories around false memories has identified a space for design where people's ability to imagine entire accounts can be used for positive effect. Someone encouraged to believe an event featured in their past will make an effort to fill in the gaps with their own knowledge, though the key to success may be judging what could be considered acceptable and ethically sound.

Figure 66: False photo frame

The final clue I present considers *forgetting*; a major characteristic of the nature of memory and an element left out of the design of many new technology support systems. I consider it important to how people naturally remember and to producing powerful unexpected remembering.

Clue 7: Designing for forgetting

Psychology research (Schacter, 1997; Conway, 1990) discusses people constructing their memories each time they remember, where the new memory is not a reproduction of the original event but a collection of memories influenced by the people and situations they remember with. As a result, when recalled from memory, some details of the original event may be forgotten especially if no tangible evidence has been created, which is why technological systems (Microsoft Research, 2012; Hoven and Eggen, 2003; Stevens et al., 2003; Bell, 2001) have been introduced to offer support. These systems favour supporting the recording of evidence of the original and preserving it as it happened, as a reproduced event. Through this 'clue' I suggest systems could be designed that assume and allow for forgetting for the value and benefits it has on personal reminiscing.

As memory is constructive, it moves through new iterations each time it is recalled. People naturally forget elements of original events and remember new information with each retelling (see *Chapter 1: Losing Memories*), but technology often fails to support this instead encouraging preservation of original evidence and forcing people to remember through a "perfect memory" (Mayer-Schönberger, 2011) and overly detailed "anchor points" (Fawn, 2011). The drive for technological support has been towards greater capture and storage of these "anchor points", but designers might consider how to design for forgetting. After all, people have to forget in order to remember.

This is highly relevant to current debate on 'internet memory' and the European Union challenge of Google for people's right to forget (Mantelero, 2013; Bernal 2010). Many European countries are challenging the Internet search engine over their privacy regulations and sharing personal data collected from users. There are also concerns over the length of time this data is kept and the difficulty people have in correcting, deleting or accessing their personal information held by Google. This contributes to current discussions around the privacy of personal information as people experience increased ubiquitous surveillance and companies see the value of people's personal data.

There are many examples of applications keeping and recording personal data indefinitely, for example the storage of all personal tweets from the *Twitter* social media site (*Figures 67-68*) with *All My Tweets Ever* (Live|work, 2011) and *Twistory* (10 to 1 & Pixelpanic, 2012) which is supported by the Library of Congress (Swartz, 2010) who announced the acquisition and storage all of Twitter's tweets too.

Figure 67: All My Tweets Ever, by live|work, creates an online archive of all tweets.

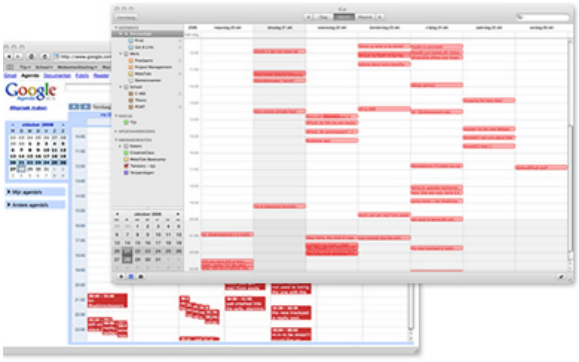

Figure 68: Twistory, by 10 to 1 & Pixelpanic, puts all tweets into an accessible calendar format.

Dodge and Kitchin (2005) explore the ethics around forgetting in an age of pervasive computing and suggest life-logging technologies need to include elements of forgetting in their design. Forgetting should not be seen as a failing of human memory, but an important process that provides filters to the onerous task of dealing with the ubiquitous information pervasive computing brings. 'It is good to forget' and using this as inspiration for design, information can be subject to a certain amount of "imperfection, loss and error" (Dodge & Kitchen, 2005). They also discuss whether life-logs should be editable, selective and open to permanent erasing by suggesting they mirror the degradation of human memory or the planting of false memories.

Life-log systems could support forgetting where system designers take inspiration from how people naturally forget, for example, fading memories of mundane tasks and activities over time as unimportant details picked up by life-log sensors gradually become forgotten, as is the case with biological memory. Otherwise, digital information could simply be given an expiration date (Mayer-Schönberger, 2011) where it is deleted permanently; bold moves away from the expectations of a complete and everlasting digital memory record.

As these researchers suggest, there are not many examples where forgetting is supported in the design of memory support. Petrelli et al. (2008) remarks that memory researchers primary focus has been on the display and sharing of memorabilia, physical

and digital, with less attention placed on integrating or 'concealing' them. Even with technology supporting reminiscing, memorabilia does not need to be displayed or interacted with to prompt memory recall, instead the environment could subtly and appropriately introduce potential triggers. Similarly, when considering the concealment of memorabilia and relating this to people's desire to move objects around, technology can play to the strength of forgetting. When deemed appropriate, a system could move between states of concealing and revealing memorabilia to offer unexpected spaces to discover memories.

Jewellery designer Jayne Wallace explores revealing and concealing memory triggers with a locket that can forget (Wallace, 2010). The locket has a display that changes each time it's opened (*Figure 69*), creating surprise through not knowing the personal photo displayed next.

Figure 69: A Locket that can forget, by Jayne Wallace, contains an image that degrades slightly each time it is opened.

Similarly, *SoundCapsule* by Hsieh et al. (2010) collect sounds recorded by a person, and sends them back in the future to prompt reminiscence (*Figure 70*). The system plays to the strength of sounds being the most difficult to remember over time and high probability that they are quickly forgotten. The sound is replayed again in the future at a time chosen by the user, where it 'randomly' appears back on the device encouraging "unexpectedness with a certain degree of association for meaning-making" (Hsieh et al., 2010).

Figure 70: Sound Capsule, by Hsieh et al. (2010), is an application that stores sounds recorded by a person, delivering them back unexpectedly in the future to prompt remembering.

Discussing the merits of systems supporting forgetting, Petrelli et al. (2008) propose a digital container that allows people to 'drop' physical and digital mementoes into it. The device is self-contained where collecting, storing, accessing and interacting with these mementoes happens through the device without the need for additional software or displays to show content. Imagine rediscovering the memento many years later and the information stored with it, alongside more information automatically added by the system, like pictures of friends from that time, events, news, music and TV programmes too.

These proposals begin to suggest how technology systems might support people's need to remember but also forget their past. Other tactics might distinguish information that should be remembered and that which is naturally forgotten, considering how certain information remains memorable. As well as important events, people and places becoming memorable, novel and distinctive experiences can be attributed to long-time remembering too (Mäntylä & Nilsson, 1998). Known as the *novelty* or *distinctiveness effect* (Schmidt, 1991), it refers to people being able to remember better when they are not expected, distinguishing them as out of the ordinary. Similarly, the *Von Restorff Effect* (as discussed in *Chapter 1: Building Memories*) identifies distinctive items within groups standing out, suggesting that designers might introduce methods that make potential triggers prominent at appropriate times to make people take notice.

Ultimately, new memory support systems should reference *forgetting* and loss of memory in their design as it is integral to remembering. Without, systems aimed at supporting memory may be less attractive if people fail to see them as sympathetic to everyday remembering (Dodge & Kitchen, 2005).

I consider designing for forgetting in my proposals by presenting forgotten objects to people in unexpected ways to promote impromptu remembering. The concept **Unexpected Display** (*Figure 71*) uses existing display areas of the home to randomly highlight objects.

In one design, sections of a display shelf move vertically to 'pedestal' objects higher than their display companions, encouraging people to take notice. In another, a display cabinet with frosted glass reveals new perspectives to the objects stored within as small areas of the glass clear. Random in where and how much of the glass clears, new and sometimes incomplete views of objects are revealed requiring people to decipher what they are seeing, refreshing contact and potentially triggering memories in the process. Both concepts offer new ways of displaying and consuming personal memorabilia, where changing the display encourages owners to engage and interact with their objects once again rather than them blending into the background and becoming forgotten.

Without forgetting, instances of unexpected remembering would be less intense and powerful as it is often longer forgotten memories that, when remembered, trigger emotionally strong memories. Through this clue, I have identified forgetting as an important process in remembering; people have to forget in order to remember. Technology systems predominantly attempt to design fallibility out in favour of offering support that preserves evidence of memories in their original form.

The argument I put forward is that by designing for forgetting, new interventions will better support how people naturally remember. Forgetting acts as a filter to the vast amount of information people generate and access, and finding ways to design for this needs consideration.

Figure 71: Unexpected Display

Conclusion

I use this chapter to introduce current understanding on involuntary memory, identifying how this aspect of memory has only recently seen major studies by psychologists (Berntsen, 2007; Kvavilashvili & Mandler, 2004; Mace, 2004) exploring its characteristics. The work published by researchers encourages support for this type of remembering, recognising it as significant to how people remember. Involuntary memory occurs frequently through everyday encounters with memory cues and through exploring 'clues' I have identified several themes that help understand how involuntary memories might be supported through design.

Clue 1: Importance of the trigger

To experience an involuntary memory a person needs to encounter a trigger to the memory, where psychology research states the type of cue is relevant to the intensity of the memory it triggers; intangible cues producing the most intense episodes. So important are triggers to cueing spontaneous memories that designers need to not only ensure the right type of cues are presented, but do this under challenging conditions. To trigger the stronger more intense involuntary memories that are often used in literary examples, in addition to the more frequent, less-intense daily occurrences, additional factors need to be correct, such as significant time since last recollection, being in a conducive state-of-mind and receptive to receiving this type of information.

Clue 2: Public personal histories

To understand how design might support cueing personal memories unexpectedly, using systems that require little or no user input is important. The work needed to curate memorabilia, which most designed systems require, interferes with conditions required for involuntary memory. Rather than creating and maintaining *another* database of information specifically for a new device or system, the existing databases people currently contribute to offer opportunities that designers should exploit. Information in these databases can be re-appropriated to support unexpected reminiscing.

People currently publish evidence of their own memories in the public realm, and consume other people's information in the same way. This shows feasibility in using other people's personal histories to cue our own and is a space that could be enhanced and extended further when designing unexpected remembering support.

Clue 3: Schema theory

Designers may be able to make assumptions about people from a basic understanding of their life and map it to stereotypical information from other people who have experienced the same, for example, era-specific music and news, or location-specific events and life-changing events. Schema theory already provides understanding about groups of people and, as seen through social media, offering potentially relevant content based on general background knowledge is generally welcomed. Using schema theory methods and approaches when designing memory support encourages the presentation of relevant information without the need for explicit input of personal information.

Clue 4: Subliminal messaging

A person's state of mind greatly influences the successful triggering of personal memories. People's ability to let their mind drift away from the focus of a current task (for example, whilst performing autonomous tasks, during forced waiting or day-dreaming) allows for responsiveness to peripheral cues and aspects of subliminal messaging. As well as states of mind offering potential for meeting 'designed' encounters with memory triggers, using subliminal messages to cue remembering offers possibilities. Designers might consider aspects of subliminal messaging and peripheral cues as inspiration to explore ways of unexpectedly receiving potential memory triggers.

Clue 5: Suggestion

Suggestion and 'hints' allow people to imagine and develop understanding around the information they are presented with. Using under-representation in the design of new systems, alongside suggestion, makes it easier to design for the challenging subject of involuntary memories. Developing designs that use suggestion to trigger memories successfully overcomes the need for people to input memory information into a system, instead relying on people to make the connections through higher-level guidance.

Clue 6: False memories and rumours

Memories can be altered significantly through outside influences, where the malleability of memory may be exposed to the extent of creating false memory. Memories can be inaccurate and by understanding the theories and features of false memories and misinformation, some of the scientific findings can be used to inspire design. Whilst designing specifically for false memories isn't appropriate, looking at how rumours

develop is, offering inspiration from their lack of concrete definition. This is good as lack of detail allows people to add prior beliefs and knowledge to fill in understanding.

Clue 7: Designing for forgetting

New systems offering memory support should be designed with consideration for one of the fundamental processes of memory: people need to forget in order to remember. Forgetting allows people to filter information and remember important facts as memory is reconstructed during each remembering episode. As current technological systems strive to create perfect evidence of memories for future recollection, they go against the nature of memory and natural forgetting. Where such systems imply people want to build perfect, pristine and everlasting digital memory representations, the extent to which this is currently done is burdensome and may interfere with natural memory.

The clues in this chapter suggest strategies for designing memory support for unexpected remembering. I develop and expand these into a final set of recommendations for design later on (see *Chapter 5*), but first, while I have explored aspects of unexpected remembering theoretically and conceptually through design proposals, I have presented few examples of the *actual* memories that come to mind unbidden. Important to presenting final recommendations for memory support is highlighting good examples of involuntary memories as evidence, and the next chapter is dedicated to finding ways of collecting this.

CHAPTER 4

Tales of the unexpected

Introduction

The previous chapter explores the potential of designing for unexpectedness and spontaneity by understanding more about the components and reasons for involuntary memories, and looking for clues to how design might support this. However, before proposing design recommendations and concepts, relating new designs back to real-world examples will show the importance of this type of remembering. I use this chapter to search for ways of collecting examples of these memories that occur unexpectedly and are delightful to encounter.

I begin this chapter by looking at how involuntary memories have been recorded through studies in the field of psychology. Though psychology studies often have different goals and requirements to fulfil, the methods used indicate ways a design exploration in the subject might successfully gather anecdotal evidence. The aim is to loosely link examples of involuntary remembering back to the theories from psychology.

I consider various collection methods, testing them to find out what is successful and what is not. This leads to a tried and tested method used in a larger exploration, sampling more people and building a database of examples. I use this database as a 'source-book' of inspiration for guiding and supporting the subsequent design recommendations and proposals found later in this document.

The overall aim for this chapter is to gather examples of unexpected remembering from daily life, to inform and support the research position, where grounding alongside real-world examples highlights relevance and support for the research.

Exploring involuntary memories

Looking for ways to discover involuntary memories, I revisit my earlier design explorations investigating the memorabilia storage areas of the home (see *Chapter 2*), where the attic was identified as a prime space for triggering memories unexpectedly. Through video, I recorded a person re-discovering the contents of their attic, where 30 minutes of footage

explores the delight, excitement and pleasure triggering long-forgotten memories brings (transcript of the video: see *Appendix 2*). This attic exploration is reflected upon to show how qualities of the attic can be used to explain what involuntary remembering means, and to find ways of re-interpreting characteristics of rummaging through the attic into the design of new memory support systems.

Video: Forgotten attic memorabilia

The method I used was relatively simple[7]: video-record and observe a person exploring their attic explaining what was kept there and why (*Figure 72*). The aim was to discover the objects people keep and why, and to get examples of their associated memories.

Figure 72: Forgotten Attic Memorabilia. Stills from videoing a couple going through the contents of

[7] The method used was inspired by Raijmakers (2007) *Design Documentaries* research. Raijmakers uses techniques from documentary film for user research to inform the early stages of design by exploring and presenting the everyday.

their attic. Filming began with factual descriptions of the objects, developing into strong emotional reminiscing and storytelling of long-forgotten items hidden in the depths of the attic.

The person in the video has created a memorabilia archive that could be described as 'extreme', and before entering the attic space he insisted he explain that his wife does not throw any memorabilia away, describing her as a 'memorabilia hoarder' and keeps anything sentimental and items 'just in case' they are needed in the future. The recording began with him annoyed at the 'junk' she had insisted was kept, resulting in odd bits of carpet and wallpaper rolls being thrown out as we started.

The attic primarily holds items from their son's childhood, a behaviour identified by Stevens et al. (2005), as well as old televisions, sewing machines, suitcases, his father's medals, boxes of collector's plates and magazines also occupying space. Notable was how his behaviour changed from frustration for keeping 'rubbish' to storytelling of triggered memories from re-discovering forgotten artefacts. As his wife was responsible for putting most of the items in there, he was surprised at finding objects he thought had been thrown away. The tone of the storytelling also changed, from factual information about the objects to emotional reminiscing of his family's past. He remarked at the end that he was emotionally overwhelmed and exhausted from remembering so many memories.

The documenting of this attic confirms this part of the house as a treasure chest of evidence of (perhaps forgotten) memories. It highlights the value store places at home have in keeping people's memories accessible. These areas are important for storing memorabilia items safely until physically needed, as Stewart (1993) remarks, "The attic and the cellar are tied to the temporality of the past, and they scramble the past into a simultaneous order which memory is invited to rearrange" (p.150-51). As these spaces are important for triggering long-forgotten memories, how can key values be translated in the design of new support?

Influential to designing support is the number of objects in the attic not explicitly kept for the memories they now trigger, but kept for use in the future. In the video recording, the act of not using these objects for a long time and subsequently forgetting them, created powerful and intense reminiscing around them. This suggests taking the quality of attic objects as generally being 'long-forgotten' rather than specific memorabilia objects.

Though the attic shows how stumbling over objects unexpectedly can trigger long-forgotten memories, they are not good examples of the involuntary remembering people experience daily. Accessing the attic is rare and infrequent, and it is because it is not experienced often that the memories triggered are strong and powerful. If people saw the

objects in the attic daily they would not have the same effect. If infrequency is key, how can designers recreate this attic experience? A designed system would need to replicate something similar to a time capsule, which is what the attic is anyway.

Away from the attic there are many involuntary memories people experience daily through encounters with the objects, environments, sights and sounds they find themselves surrounded by, but often have no control over. Most daily involuntary memories are unremarkable (Berntsen, 2009), but occasionally some of them are just as intense and powerful as memories experienced in the attic. In the next section I explore ways to capture examples of these daily involuntary memories and the situations around them.

Documenting the unexpected

Due to the nature of involuntary memory as just that, involuntary and uncontrollable, capturing everyday examples of its elusive serendipitous and random qualities is difficult. To understand how this might be done, I consider ways evidence has been collected and documented by other researchers. In design, good examples come from cultural probes research (Gaver et al., 2004). For instance, Dream Recorders (*Figure 73*), developed[8] as part of a larger probes study, use digital memo-recorders, repackaged with instructions that invite people to pull a tab to trigger recording 10 seconds of their description of a dream

[8] Brendan Walker designed and developed the Dream Recorder probe in particular.

Figure 73: Dream recorder, by Gaver et al. (2004).

upon waking. This device seeks the recording of dreams (and not memory), but nonetheless offers insight to how evidence of fleeting and unexpected thoughts can be captured.

Collecting evidence of involuntary memories has been documented in psychology experiments that use a scientific approach for capture (Berntsen, 2009; Mace, 2007). Though these have been conducted through a psychology 'lens', exploring how they have been tried and tested in their field may show ways of applying similar methods with a design perspective for this research.

There are differences between collecting evidence of unexpected remembering for psychology research compared to design as though both seek examples of involuntary memory each academic field has different tolerances of how evidence is collected, collated and what qualifies as acceptable in terms of whether it is measured accurately, and if it needs to be measured at all. For psychological studies primary aims are for accurate evidence, but for design there are often other requirements such as gathering and understanding data to provide key actionable insights and move the design process forward. Important to my research is collecting the stories and evidence from people about their lived experiences (Wright & McCarthy, 2010) with the aim of inspiring new design directions and ideas. Both research fields, however, start with the same concerns: How do you record involuntary memories?

If an involuntary memory is something unexpected, fleeting, often intangible, personal and rare, how can it be recorded and presented? Of the psychology studies that have explored this subject, there is limited research published documenting actual examples. For the few researchers who have (Berntsen, 2009; Mace, 2007; Kvavilashvili & Mandler, 2004) a shared view of collection is the *sampling method*, where real-world examples of the experience are collected.

The sampling method freely selects examples of the phenomenon, for example, private anecdotes and general observations, rather than collection through a systematic study. As Berntsen (2009) remarks, examples describing involuntary memory in published material come from fictional literature, autobiographies or anecdotes from the author's experiences and not from systematic studies. A weakness of this method may be researchers looking for examples that fit their theories rather than reporting on all instances, so considering the sampling method against other methods, I analyse the benefits of each and suggest the most suited to my research goals.

The *survey method* invites large groups of people for a retrospective of involuntary remembering episodes (Berntsen, 2009). Asking people for examples encourages accessing the most vivid and perhaps emotionally charged episodes, and some examples could be missed. These may be smaller and less significant, but potentially important for studying the subject in terms of when, where and how these memories occur. Moreover, retrospective remembering (Ellis & Cohen, 2008), explored by the survey method, is a form of voluntary remembering of involuntary memories and thus prone to reconstruction and filtering. In this instance, the distorting effects of voluntarily remembering involuntary memories would seem to particularly apply when remembering the triggers to involuntary memories. This process contradicts the aims of this research, so is not pursued further.

The *diary method* records involuntary memories generally, as and when they occur (Berntsen, 2009). Participants carry a diary around where they record involuntary memories as they happen, so not relying on retrospection (a flaw of the survey method). The method offers access to the context in which involuntary memories occur, giving clues to the triggers and states of mind around remembering. This method encourages anecdotal evidence of involuntary memories: examples which together highlight frequency over a set period of time (the length of the diary study), but individually stand as good examples of involuntary memory and inspire new ways to think about memory support. Diary entries describing a strong involuntary memory could be used as a brief for a new design concept, where written memory accounts present alongside final design work to illustrate successful support for real-world experiences.

The final method considered is the *laboratory method*. Though used often in scientific studies due to the systematic control it affords, there are many reasons the laboratory method is not appropriate for studying involuntary memories. The characteristics of involuntary memory conflict with collecting examples in the laboratory: occurring randomly, during everyday activities. Cohen (2009) states, because memories are involuntary they cannot be elicited in the laboratory, though over the years some psychology researchers have tried to disprove this. Successful laboratory studies have needed to replicate and encourage the natural settings and behaviour needed at encoding and retrieval. Some (Hall & Berntsen, 2008; Holmes et al., 2004; Horowitz, 1986) have been successful in recording involuntary memories this way as they have accounted for conditions around focused and predefined tasks, like watching a film or conducting an activity, but they have very different goals to this research.

For good anecdotal examples of involuntary memories, it is best studied in natural settings, as it is difficult to replicate experiences in the laboratory. Supporting this further,

the area of psychological research relevant for understanding the nature of involuntary memory comes from 'everyday' or 'ecological' memory. Everyday memory is studied in its natural context, commonly through diary studies, where people record events over a set period of time. Neisser (1978) believes everyday experiences highlight the important questions people should be asking about memory, proposing an approach to memory research that examines naturally occurring memory phenomena, in the context of the real world.

Studies of the unbidden past

To collect examples of involuntary memory, the diary study method seems most suited to the goals of this research. A significant psychological study documenting real-world examples is Berntsen's (1996 & 1999), who pioneered the first known diary study collecting involuntary autobiographical memories. Over a 7-week test period she collected her own involuntary autobiographical memories: over 100 examples, experiencing 1 or 2 significant involuntary memories a day. Alongside the description of the memory she recorded information regarding the context of recall, her thoughts and emotions at the time, the age of the memory, vividness and the frequency of prior rehearsal.

Aspects of Berntsen's method supports requirements for this research as she collects contextual evidence of place, time, state of mind and the environmental triggers around the reminiscing episode. Her results show involuntary memories are common in daily life with most experienced and followed by successive recollections. She also notes they are often triggered by sensory experiences and other people, and are cued by the external world rather than internal states of mind, stating "Metaphorically, one might say that the lives we have lived have left traces and marks in our environment that subsequently serve as cues for our personal memories" (Berntsen, 2009, p.60).

During her study, Berntsen remarks many involuntary autobiographical memories come from the previous year (Berntsen & Hall, 2004), clustered around highly significant personal events, rating the majority as vivid with a quarter of them never thought about before. However, a few refer to very remote events, having the *Proustian* (Proust, 1928) quality of bringing back dormant, vivid memories that have not been thought about for a long time (Berntsen, 2009).

To further support this method, diary studies have long been used in design research as a way of providing insight and extracting elements of user behaviour. Gillham

(2005) comments on them as a useful tool for (cross-cultural) design research, remarking how the combination of elements from the classic laboratory-style usability studies, along with location-based ethnographic methods investigating user requirements, collects successful evidence and inspiration for design-based research.

As a method, they have developed through two strands of research, psychology and anthropology, each trying to uncover different information. For psychology, frequency is sought, and importance and impact of events in the participant's daily life (Gillham, 2005). With anthropology, requirements document any information the participant feels important. Though not one method is tested fully for this research, exploring psychology-based *diary studies* alongside theories developed around *cultural probes*, I have developed suitable iterations to explore the subject for this research. These are reflected upon in the next section where I collect examples of involuntary memories.

Diary method trials

Between September 2008 and December 2008, I ran two pilot studies to test diary study methods. My overall goals were to collect evidence of involuntary memory episodes in natural settings, whilst going about everyday activities. Purposefully, the methods and tools used do not intrude greatly in everyday activities but simply document the episodes quickly and concisely as they occur, collecting introspective evidence in the form of written diaries with supporting contextual photographic evidence. These studies are discussed in detail with their results, good and bad.

Diary method trial 1:

Record 2 involuntary memories daily, 3 months

This method attempts to record the more intense involuntary memories experienced a few times a day, as referenced by Berntsen (2009). She describes these as "a memory of a personally experienced event that came to my mind with no preceding attempts at retrieval" (Berntsen, 2009, p.58).

The method I use is loosely based on Berntsen's (1996) from her preliminary diary study on involuntary autobiographical memories and collects additional information around the episodes, for example, when they occur and the type of triggers, to explore whether involuntary memories can be reliably associated with certain triggers and contexts, or a person's state of mind.

Method

An 'off-the-shelf' pocket diary is used, small enough to fit in a pocket and carried around or nearby, everyday for 3 months with written accounts of involuntary autobiographical memories recorded as they occur. Noticed by Berntsen (2009), but also evident when considering personal experiences of involuntary remembering, these memories are quickly and easily forgotten if not recorded straight away. Berntsen adopted methods to compensate ensuring that entries were made into the diary study in 2 stages: as soon as the involuntary memory happened using keywords and notes, and later, perhaps at the end of the day when there was more time to write in greater detail about the memory, emotions, situation and context. I use this method too, where for 3 months all of my significant involuntary memories are documented each day, written down in the diary using keywords as the memory is triggered and written up in greater detail later that same day. I recorded the trigger, context and memory with as much detail as possible.

Results

I found the method works well in creating a collection of involuntary memory examples, but certainly did not collect all daily involuntary memories. Some days it was easy to record a couple of examples, other days it was a struggle. On very busy days it was difficult to dedicate time to recording details of 2 'good' involuntary memories and challenging remembering the details at the end of the day, or the following day when the diary could not be completed the same day. On days memories were recorded the following day, they were often forgotten in their entirety and left in note form.

As a consequence of carrying the diary, I felt I was more aware of triggering memories. Also, the act of writing down probably influenced what I remembered, where I found those memories written down later were not a pure account of the initial moment of remembering but a subsequent reflection, remembered throughout the day and during the act of writing. Berntsen (2009) reflects on similar findings from her study from where this method and approach derives. For easier, more accurate ways of recording it may be better to carry a voice recorder to record as soon as a memory is triggered, and maybe photographing the trigger would help too.

Using the diary method to record spontaneous memories may have lead to an inability to capture the actual moment involuntary memories occurred, especially as it was conducted over a long period; 3 months in this case. Though the method was good for

prompting myself to record specific information by answering questions, the task sometimes felt laborious when repeated many times. Finding ways to capture the 'in-the-moment' context of involuntary memories, maybe through photographing the environment as a snapshot, should be explored further.

Other concern with this particular method was duration: it was difficult to keep motivated and excited recording involuntary memories over such a long period of time. My recommendations would include sampling a larger number of people to generate more examples and keeping the study much shorter, perhaps just a day. I tested the one-day diary study method next.

Diary method trial 2:
Involuntary memories experienced during 1 day

To consider collecting the few strong involuntary autobiographical memories people experience daily amongst the many more that have far less impact (Berntsen, 2009; Mace, 2007), I trialled a 1-day diary study.

Method

I recorded all involuntary memory experiences in a diary over the course of a day (16th September 2008). The episodes were recorded with a photograph to show context and, to provide understanding, concurrent audio descriptions of the memories were captured with a voice recorder, time-stamped for ease of cataloguing the day's events. The day had both routine and non-routine activities. During the morning I visited a college I studied at over 10 years ago for a work–related conference, travelling the same route I used to many years ago and I spent the afternoon working from my studio at home; something I do most days.

Results

I printed the photo for each memory with the accompanying voice memo typed alongside. Arranged into a 'book'[9] in chronological order with the recorded time stamp, there were over 100 involuntary memories from the day however, this may be higher than average due to the nature of the day, as already discussed.

Re-visiting my old college, most memories triggered reflected my time studying there. Many were memories of factual information rather than specific storytelling and emotions. Very few were examples of totally random and bizarre memories, but those that

[9] The 'book' of photographs and associated memories can be found in Appendix 3i: *Book of results*.

were, were of memories not remembered often, if at all. Many of the stronger memories did not seem to have an obvious trigger and had not been remembered since the original event, with the strongest from childhood. For these, remembering seemed solely dependent on my state of mind: non-focused and daydreaming when presented with the memory trigger.

Seven involuntary memory episodes from the day that stand out as prime examples of the unexpected remembering this research aims to support are shown in *Figures 74-80*. Noticeable are how some memories from the day were more emotionally intense than others. These are the focus of deeper exploration that I consider under different categorisations, including how the trigger relates to the memory, the state of mind when cued, the age of the memory, the frequency rehearsal and the type of trigger (for example, a thought, place or object). I form these categorisations around theories from psychology studies (Berntsen & Hall; 2004, Kvavilashvili & Mandler; 2004, Mace; 2004, Berntsen; 1996), and discuss my results against these (see *Appendix 3ii: Analysis mapping exercise*) to 'loosely' link my results to existing research. The results of this are now discussed in relation to the theories put forward by psychology researchers.

Figure 74:

08:43 Queue of traffic in Caerleon… rusty gate reminding me of treasure hunts run by the squash club, driving around the countryside on Sundays.

This was a completely unexpected and bizarre memory to remember. I use to enjoy the treasure hunts when I was very young, and vividly remember one occasion passing through a rusty gate. It was the same perspective: driving alongside, looking through the rusty gate into a field with a piece of bailers twine tied on the gate. This memory was involuntarily triggered whilst sat waiting in the car, in a non-focused, non-task state. The age of the memory was over 20 years (my childhood), and it had never been remembered before.

Figure 75:

11:08 Image in presentation… remembering a performance at Shristi design school in India, students dancing with orange / red lighting.

This felt like a 'snapshot' where the image looked identical to the original event, with the same colours. This involuntary memory occurred during a learning task, whilst my mind was accepting to taking in new information. The image cued the memory, with the trigger vaguely related to the original encoding through its similar composition. It was only a few years since the original event was encoded, but it had never been recalled before.

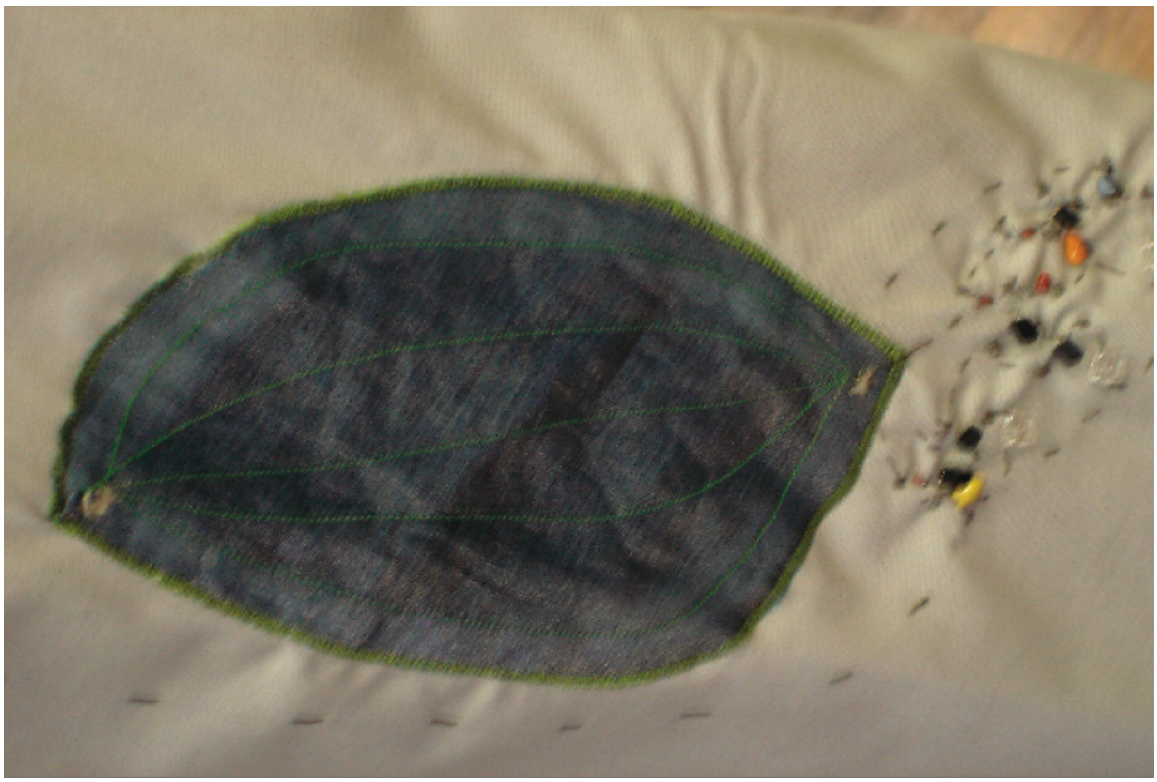

Figure 76:

11:48 Dress in exhibition… LED's lit up, remembering poppers on a Barbie dress when an elderly friend used to make them for me (I was about 6 years old).

It was the look of the 'hand-sewn' poppers on the fabric, with the threads still long, just like on the Barbie dresses that triggered the memory. It was a very intense memory recalled during a learning task when taking in information, where the trigger was vaguely related to the original memory. The age of the memory was over 20 years, again back to my childhood, and the memory had never been previously recalled.

Figure 77:

13:02 Walking past the stairs… strong smell reminding me of hospital stay when I was very young to have my teeth taken out.

This memory is occasionally triggered with a strong smell of disinfectant. On this occasion the involuntary memory was triggered during a non-focused and automatic activity (walking), where the trigger was intrinsically related to the actual memory. The original memory was more than 20 years ago and has occasionally been triggered since the original encoding.

Figure 78:

13:09 Car sticker for HP… An image of the HP building lit-up, in a photograph.

The cue triggered a very vivid memory of the photograph and the colours in the photograph. It is a sticker I see everyday, but I have never remembered the photo as a result. The memory was triggered during a non-focused and automatic activity (walking), with the trigger vaguely related to the memory with regard to the place it represented. The memory was fairly recent, only a couple of years since the first encoding, but it never had been remembered before.

Figure 79:

22:25 Looking at dining table leaning against units… Jayne having her baby last year, and not met up with them yet.

This was a mind-popping experience with absolutely no clue where the memory came from. The involuntary memory was triggered during a non-focused state of mind, whilst daydreaming. There was no obvious trigger to the memory where the external surroundings had no relation to the memory recalled. The age of the memory was less than a year and had never been remembered before.

Figure 80:

23:06 Drifting off to sleep, eyes closed… remember buying an Ocarina (musical instrument) at a craft fair, somewhere in Bristol, with my parents when I was 10 years old. I remember the pattern on the Ocarina.

This was another mind-popping experience where I was unsure of the memory trigger. I found I was also trying to search for more information during the recall, for example, the location of the fair and the building's appearance. Vague information came to mind, but nothing definitive. The memory was triggered during a non-focused state of mind, whilst trying to go to sleep, with no obvious cue to a memory that was over 20 years old. The memory had never been remembered before.

Chaining

Mace (2007 & 2005) identifies how involuntary memories often occur as a result of voluntary remembering and my exploration supports this view, that involuntary memories can be produced as a by-product of other memories. Goal-driven tasks, such as going into the attic, moving house or decorating are defined as chained involuntary remembering (Mace, 2007), as a person understands they will experience reminiscing though they may be unsure of what it will be. Caused by coming into contact with triggers, design explorations of the attic (see *Chapter 4: Exploring Involuntary Memories*), second hand memories at car boot sales (see *Chapter 1: Design Speculations*), inherited objects (see *Chapter 1: Design Speculations*), and the display areas of the home (see *Chapter 2: Design Speculations*) all reflect this type of remembering.

Similarly, re-visiting the place I studied at cued chaining of memories, though there is less evidence of this chaining during 'routine' activities from the day. I explore chained involuntary remembering in greater detail during the design stage when looking to support unexpected remembering, as proposals *Memorabilia Self-Storage* (see *Chapter 2: Design Speculations)* and *Memorabilia Post* (see *Chapter 4: Design Speculation*) have these characteristics.

Age of the memory

Many of the stronger intense involuntary memories are from a long time ago, often childhood (Berntsen, 2009; Mace, 2007). During the day, a combination of very old memories along with those not remembered often, triggered the most powerful and emotionally charged memories, where the length of time since visiting college significantly influenced the intensity of the memory.

Current activity

Most involuntary memories were triggered during fairly autonomous task, for example driving, walking and waiting; a characteristic identified by Berntsen (1998) and Schlagman et al. (2007) in their studies. Mandler (1994) also notes involuntary memories are most likely to occur when conscious processes are directed elsewhere, whilst automatically dealing with other material. I found the most intense memories occurred whilst driving, when my mind was wandering elsewhere and driving became almost autonomous. This was helped by lengthy time spent in stationary traffic. My examples support this theory

that involuntary memories are most likely to occur during undemanding, unfocused and ongoing activities (Schlagman et al., 2007).

Presence of triggers

Identifiable and recognised triggers cued the majority of involuntary memories during the day. Many psychology studies (Schlagman et al., 2007; Berntsen & Hall, 2004; Kvavilashvili & Mandler, 2004; Berntsen 1998, 1996) identify clear triggers to memories, though my examples conflict with theories regarding the memory triggers put forward by Mace (2004). He classified triggers as either abstract (thoughts, all aspects of language, other memories), sensory / perceptual (tastes, smells, perception of objects) or state based (mood, physiological). Mace and others (Schlagman et al., 2007) suggest abstract triggers are most common in cueing involuntary memories, though my examples do not fully support this, instead showing sensory triggers cueing the most intense involuntary memories which is in line with the *Proustian* view (Proust, 1928) that psychologists had begun to question (Ball, 2007).

The *Proustian* view suggests the spontaneous recovery of a seemingly long-forgotten scene is typically activated by sensory cues and a strong joyous feeling of reliving and travelling back in time. Though not all examples from the day have this strong feeling, the more powerful and intense memories were certainly triggered by sensory rather than abstract cues.

Rehearsal frequency

Berntsen (2009) remarks the more events are talked about, the more they are remembered involuntarily, though my examples show it is the memories not remembered often that produce the most emotionally intense episodes. The more powerful involuntary memories recorded had not been recalled since the original encoding, and it is these that present as 'forgotten' memories and elevates them with this 'gift-like' feeling Benjamin (Leslie, 1999) talks so positively about when describing involuntary memories.

Type of trigger / cue

Evident was how triggers directly linked to memories did not produce the strongest involuntary memories. The more intense accounts of unexpected remembering came from vaguely related triggers; not cued from explicit triggers or kept memorabilia, but hints towards them. This supports theories around the nature of memory (see *Chapter 1: Visiting Memories*), where a hint or suggestion can be all that is needed to trigger remembering (see *Chapter 3: Suggestion*). If original artefacts are not needed, less pro-active

memorabilia archiving can be supported. This is crucial for designing support as just needing to hint towards a potential trigger, and not the original from the time of encoding, negates preservation of original source triggers.

Ingredients of a 'good' involuntary memory

Reflecting upon the examples of involuntary remembering collected, I judge these seven as 'remarkable' with regards to the feelings and emotions they trigger, as the memory was experienced in an unexpected and euphoric manner. I summarize the common characteristics of these examples.

Sensorial priming

Most (five out of the seven) memories were triggered as a result of sensorial cues. These cues were either smells or physical artefacts, though not explicitly related to the original encoding of the memory.

Daydream remembering

Nearly half of the memories I consider 'special' and totally unexpected. These occurred during non-task activities where little or no focus was needed and I was able to drift away from current tasks.

Unnecessary Memorabilia

Six out of the seven memories were triggered by cues either vaguely or totally unrelated to the memory. Just 'hints' to original memory triggers were all that were needed: they simply needed the 'look' or 'feel' of the original to bridge that link and trigger the memory. The evidence of the memory from the original encoding was not needed.

Un-charted territory

The most powerful and emotional involuntary memories had never knowingly been previously remembered.

Childhood treasures

The strongest involuntary memories recorded originated from childhood.

These characteristics may be developed and used to test memories triggered as a result of new design concepts and approaches, where new designs might be classed as successful in supporting unexpected remembering if the memory triggered has the qualities discussed above.

Of the two methods explored, the one-day diary study proved most successful. The approach was good for collecting many examples of involuntary memory: the frequent, less significant accounts as well as less frequent, strong emotional memories that send a person back to a long-forgotten past. I feel both are important and need recording, if only to be able to distinguish between them and understand the differences and conditions that trigger each type. I now develop the method of recording all involuntary memories from 1 day to sample a larger number of people. By extending this approach to include more people generates a larger collection of real-world examples.

1 Day: Many people, many more memories

Following the successful collection of involuntary memories from a day in my life, I asked 9 people to join me in recording all involuntary memories on one day: 1 July 2010. Having more people involved allows me:

- To obtain a larger quantity of examples.
- To obtain examples from varying demographics.
- To offer understanding around what people class as involuntary memories.
- To uncover more of the valuable and raw involuntary memories which occur infrequently.
- To allow for discrepancies in people's understanding of the requirements: it can be difficult to grasp recording only involuntary and not voluntary memories. Having more people participate allows for the possibility of incorrect recording.

My aim is to collect and present the involuntary memories as a source book to inspire and suggest new spaces to explore further through design, and as an expression of human behaviour and everyday life that anyone might be intrigued by.

Method

The initial diary trial worked successfully so I changed little in the way the memories were recorded. My focus was on organising and labelling the recording of memories clearly, so tools were designed to keep track of potentially hundreds of photographs and their associated written memories. Individual diaries produced for the day and corresponding labelled data storage CD's, offered clear instructions in personalised folders inviting participation. These were the instructions given to people:

Equipment needed: camera or camera phone, pen and paper, or voice recorder

Record all moments of unexpected remembering from waking to sleeping for 1 day. These moments need to be recorded with a photograph of either the 'trigger' that caused the remembering or the 'situation' you were in, in which the remembering occurred. You also need to jot down or voice record details of the memory triggered. The details of the memory can be noted briefly and explained more fully later on if it's not possible to do so straight away.

Please don't 'force' remembering by finding old photographs, ornaments etc by which to remember: it is not this kind of remembering that we are interested in. We are interested in the memories that just 'pop-in-to-mind' when you're going about your day-to-day tasks. For example, hearing a song you listened to when revising for 'A' level exams now being played on the radio, the smell of disinfectant triggering memories of a hospital stay.

You may be surprised by how many of these types of memories spring to mind during the course of the day. There is no right or wrong amount to record. People we've spoken to in the past have noted anything from 20 to 50+ moments in 1 day. And there is no right or wrong photograph to take, just photograph whatever it is that triggers the memory. If it is something intangible like a smell or sound, photograph the context and describe what it was when making the written or voice recorded notes. When writing or voice recording the memory details the memory needs to be described with as much information an 'outsider' would need to fully understand what the memory was about.

The tools for collecting make use of the mobile devices people already carry, or might be happy to carry with them for the day, such as camera phones, so there was as little intrusion as possible in their daily activities. The packs included a paper diary to aid recording memories, which was small enough to carry around to make notes and allowed for expansion on written notes later on. The diary had enough pages to suggest they may have 20 + involuntary memories over the course of the day. People also received a blank CD to copy photos onto at the end of the day, numbered corresponding to the pages of the

diary, and the design of the diary allowed the photographs to be shown alongside people's written memory accounts in the final presentation of results.

My concerns from previous explorations, such as potentially missing data as information was expanded upon in greater detail after the event, were outweighed by the benefits of collecting narrative alongside visual evidence of involuntary remembering. Other concerns were for people becoming editors of the information and being selective in what they include as result data by editing to avoid exposing embarrassing or intimate memories. They may have decided not to include information they deemed unimportant but may have been relevant upon reflection. In some ways, the potential failings and inaccuracy in recording may benefit when it is used for design inspiration rather than psychological analysis, as the affordance of a diary allows people to choose, edit and describe examples, and offers real-world presence, quality and empathy: a direct lens into someone's life and thoughts.

The people chosen form a mixed demographic: ten people, male and female, old and young, and a diverse mix of students, part-time and full-time workers, homemakers and retired people.

Results

The day produced in excess of 200 photos, each with a written memory account presented as a book to explore and offer inspiration[10]. The book offers an invitation to peek into the lives of others, comparable to the *Post Secrets* (Warren, 2008) project and books[11]. Similarly, presenting the results as a collection in a book offers readers chance to discover other people's, usually private, memories.

The book (*Figure 81*) presents these memory accounts as *moments of unexpected remembering collected from 10 people on one day, the 1st July 2010, from waking to sleeping,* using the time-stamp of each memory to chronologically order everyone's memories into a single, one-day narrative. Presenting everyone's memories together shows the different memories different people may have at the same time, on the same day. It also shows how over the course of the day, people's accounts of remembering generally changes from episodes of unexpected remembering when waking, through to

[10] The book from the exploration day is presented as a printed book available on request and also as a pdf in *Appendix 4i: Book of results*.

[11] The *Post Secrets* books present collected postcard images with an accompanying secret written on the back on the back by the postcard's owner, encouraging readers to immerse themselves in the secrets of others.

prospective remembering (not the aims of this study, see *The Unsuccessful Results* in the next section) when getting ready for the day. Evident are instances of remembering around

Figure 81: 01.Jul 2010, Book of photos and memories from the collection day

task-driven activities in the morning to more retrospective and unexpected remembering episodes later in the day. Influential to the examples collected were significant events taking place on the day. The day was intentionally chosen as my aim was to collect good and inspirational examples of unexpected remembering over recording occurrences of unexpected remembering on an 'average' day, as psychology-based studies may require. Some people had children starting school that day so many memory accounts refer to this and their own long-forgotten memories of their time in school.

Mace (2005) notes people create priming events to encourage involuntary memory occurrences, for example, voluntarily remembering a time in their lives and their own experience of starting school which primes additional involuntary remembering around that period in their life. He describes priming as sometimes responsible for everyday involuntary memory production, where forcing voluntary memory recall causes near future involuntary remembering about the same event or time period, and this is evident in my collection. I discuss the people's responses in greater detail with the most successful examples of unexpected remembering informing and inspiring design recommendations at

the end of this chapter. To begin, I explore the unsuccessful results, finding out what went wrong and why.

The unsuccessful results

The design exploration captured examples of unexpected remembering, though explaining to people the requirement for this *exact* type of remembering was always going to prove difficult as people rarely take stock of the differences in how they experience memories. Even taking care with the instructions, and showing examples allowing people to question the exacting requirements still resulted in many examples of *prospective* remembering (Baddeley et al., 2009), or 'forced' moments of *retrospective* remembering where people purposely sought objects and places that trigger memories. Using terms such as *prospective* and *retrospective memory* to explore and discuss why some results are successful and some not, helps a great deal.

Examples of Prospective memory

Prospective memory deals with remembering to perform tasks and activities in the future and many examples collected during the day are examples of this. Though triggered through encounters with objects in the environment, perhaps met by chance, these examples of prospective remembering are not the memories I sought. The following (see *Figures 82-85*) are examples of *Prospective Memory* collected during the day[12].

[12] From the examples collected, I have chosen *key words* from people's written accounts of their involuntary memories and used them as a graphical treatment to highlight the thoughts and feelings the unexpected memories triggered. These may be seen on some of the images from the book which are presented here as examples.

Figure 82: Example of Prospective Memory, 06:58

Figure 83: Example of Prospective Memory, 08:10

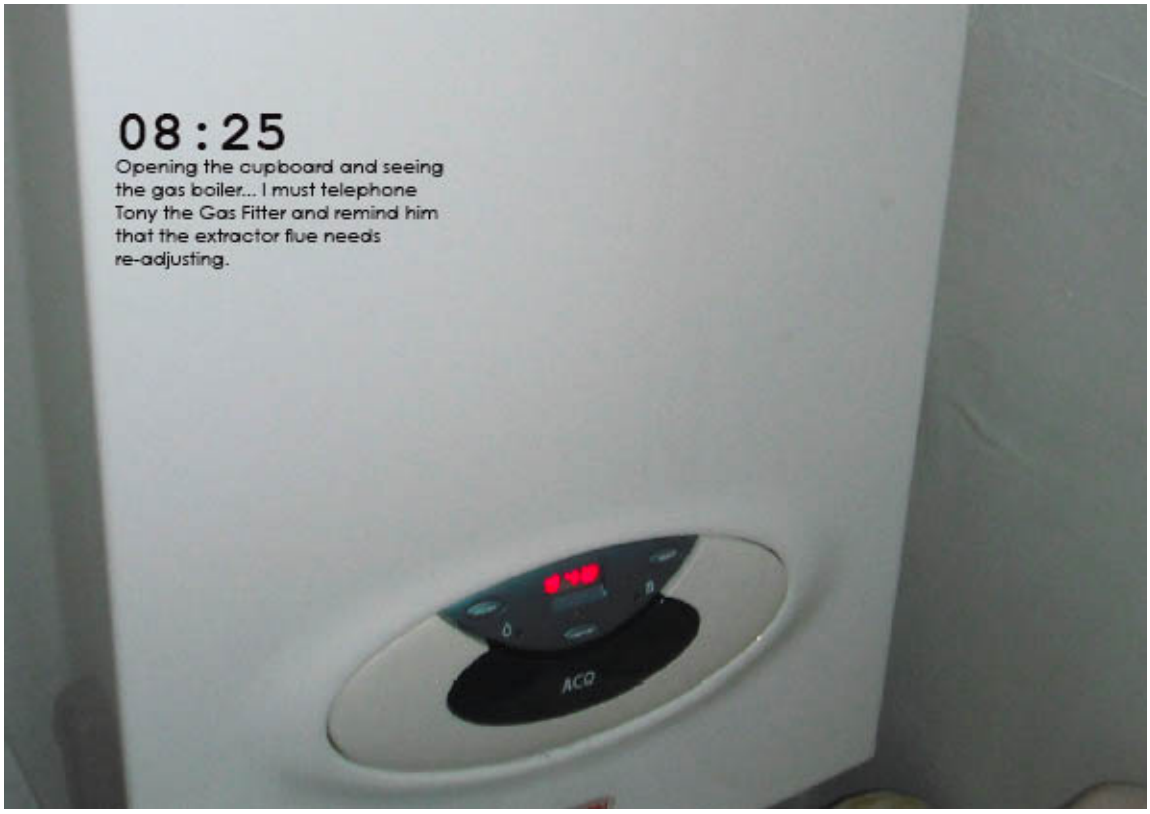

Figure 84: Example of Prospective Memory, 08:25

Figure 85: Example of Prospective Memory, 19:00

Examples of voluntary remembering

Many examples from the day focused on aspects of voluntary remembering where people purposely searched for, or were aware of generating remembering through explicit memory triggers, for example, memorable objects and places. A significant number of the examples discuss memories around objects they use or see many times a day, where people are unlikely to access associated memories each time they use it (Garvey, 2001; Marcoux, 2001), had it not been for this research.

Though not evident in the book produced as it presents people's results as a group rather than individually, some people purely focused on documenting voluntary remembering rather than the involuntary remembering episodes required, therefore not fully understanding requirements. The following (*Figures 86-89*) are examples from those who purely sought and took photographs of memory triggers in their environment, where their results delivered accounts of *voluntary remembering*.

Figure 86: Example of Voluntary Remembering, 15:30

Figure 87: Example of Voluntary Remembering, 16:00

Figure 88: Example of Voluntary Remembering, 19:00

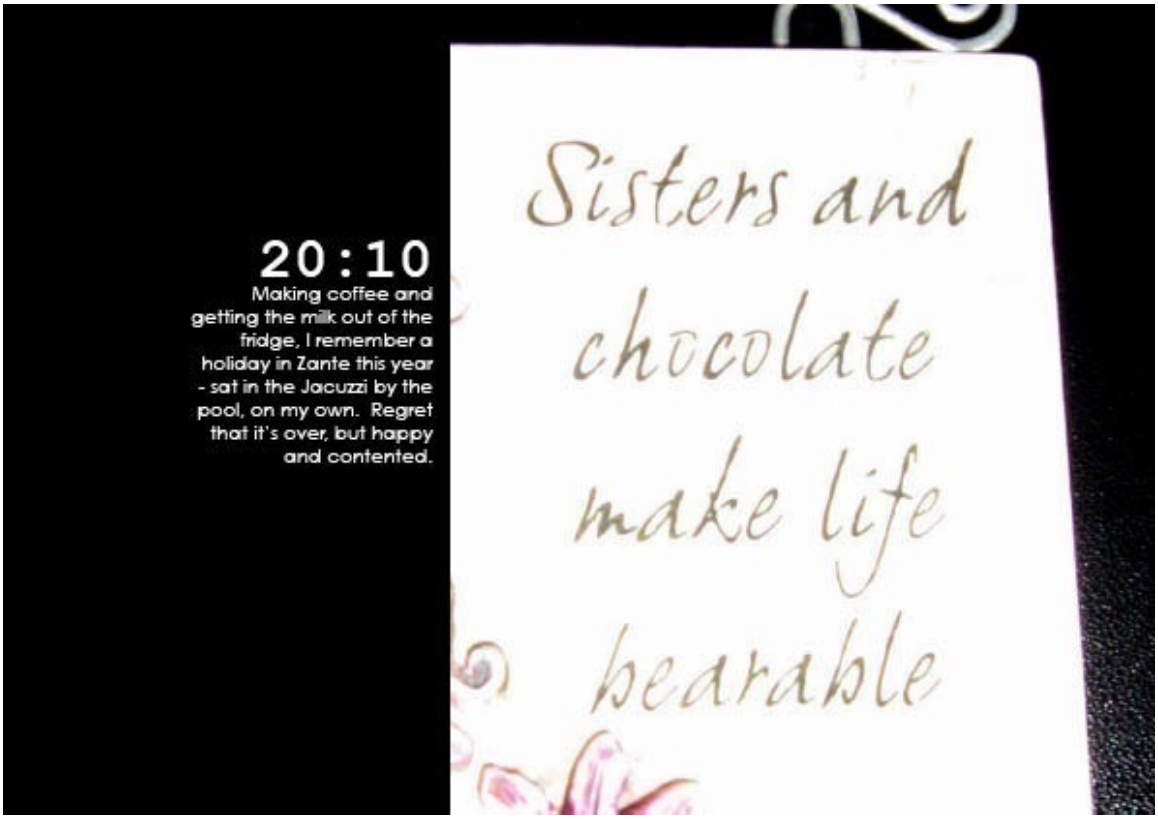

Figure 89: Example of Voluntary Remembering, 20:10

There may be any number of reasons for these unsuccessful results though lack of understanding around the term 'involuntary remembering' and failing to grasp the specific type of remembering sought is the likely cause. Additional explanations with illustrated examples, and a trial day with all people involved beforehand may well produce a higher success rate, however, sampling a relatively large group of people has brought many successful results too.

The successful results

The examples that follow showcase the evidence of involuntary remembering sought. I consider these successful as they describe the very intense, sometimes random and bizarre memories that come to mind through memory triggers met by chance. They describe people's states of mind and musings with other people, which involuntary memories are defined by (Berntsen, 2009; Mace, 2007) and the following (*Figures 90-99*) are ten *good* examples of unexpected remembering collected during the day.

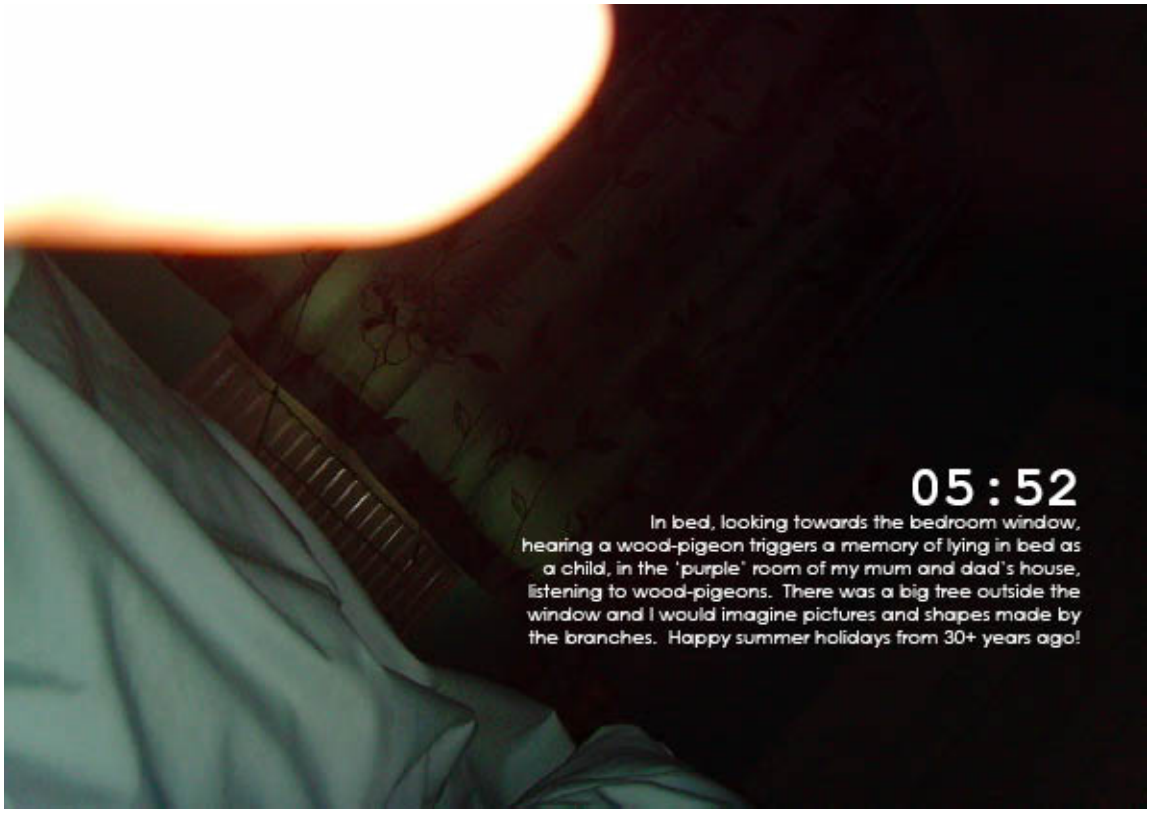

Figure 90: Example of Unexpected Remembering, 05:52

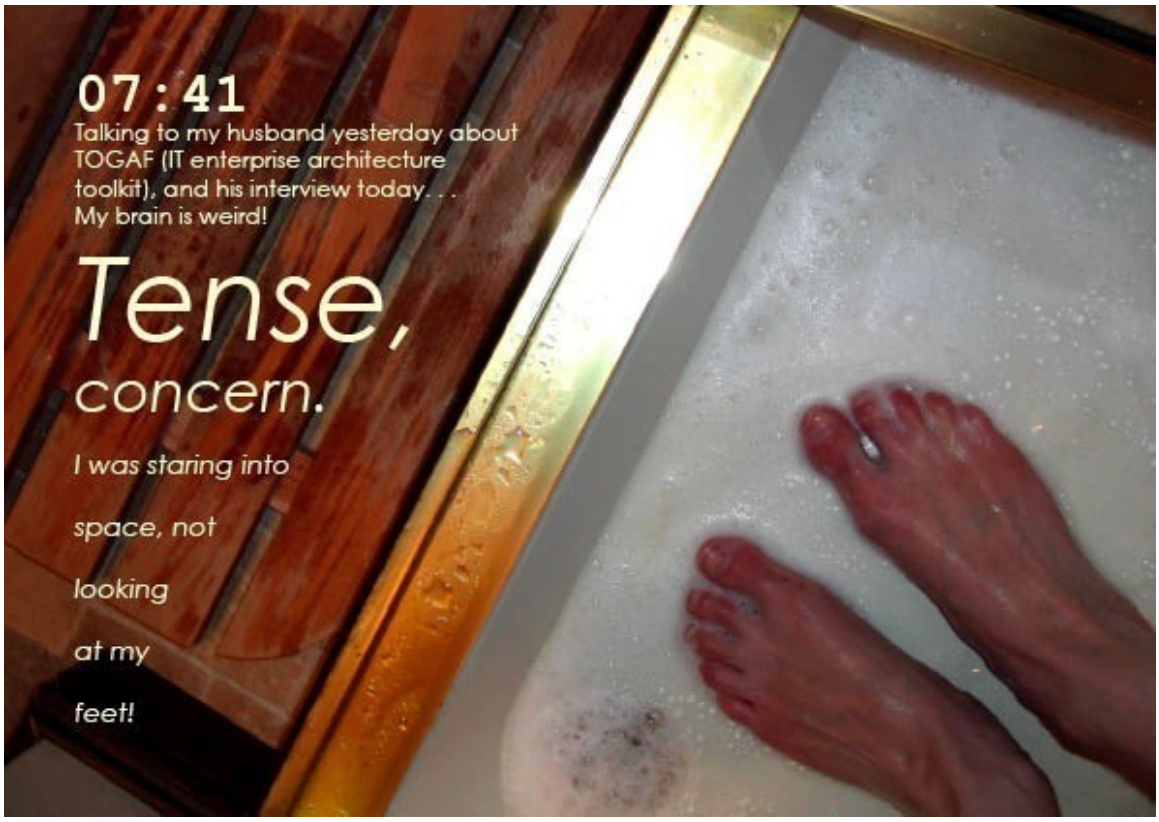

Figure 91: Example of Unexpected Remembering, 07:41

Figure 92: Example of Unexpected Remembering, 08:02

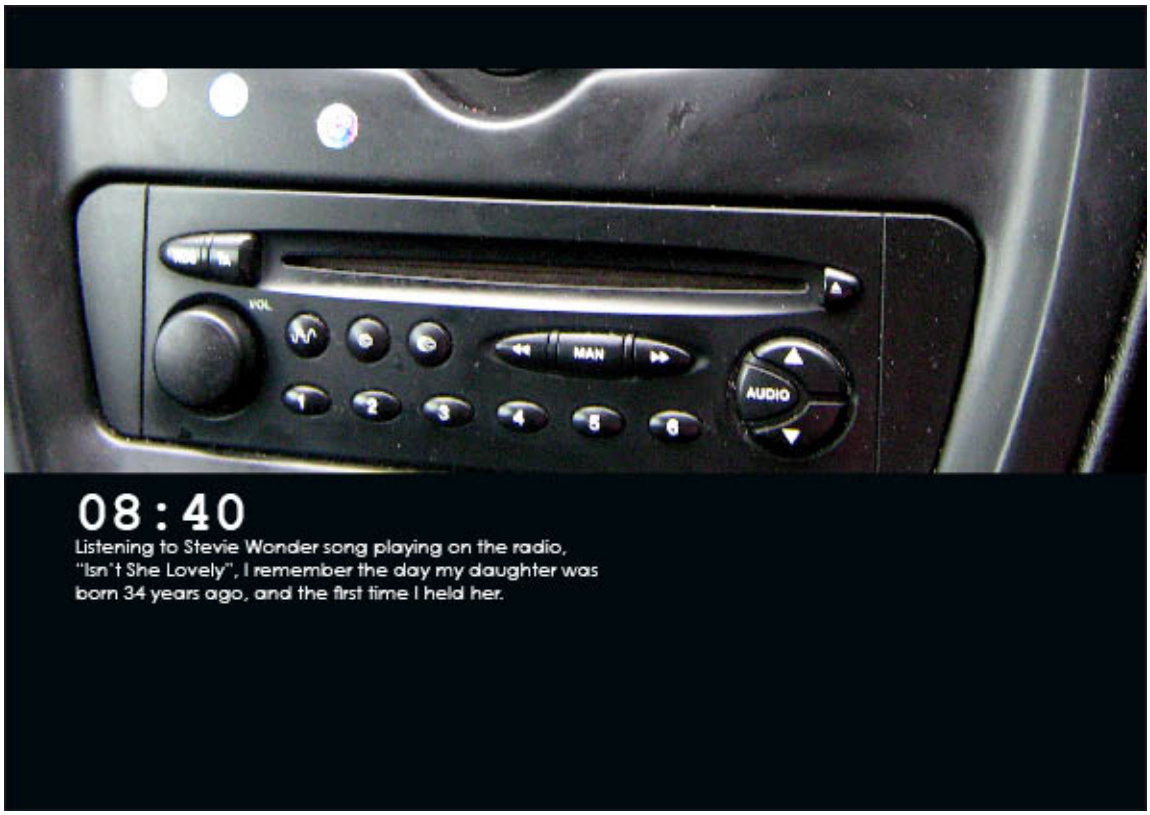

Figure 93: Example of Unexpected Remembering, 08:40

Figure 94: Example of Unexpected Remembering, 09:15

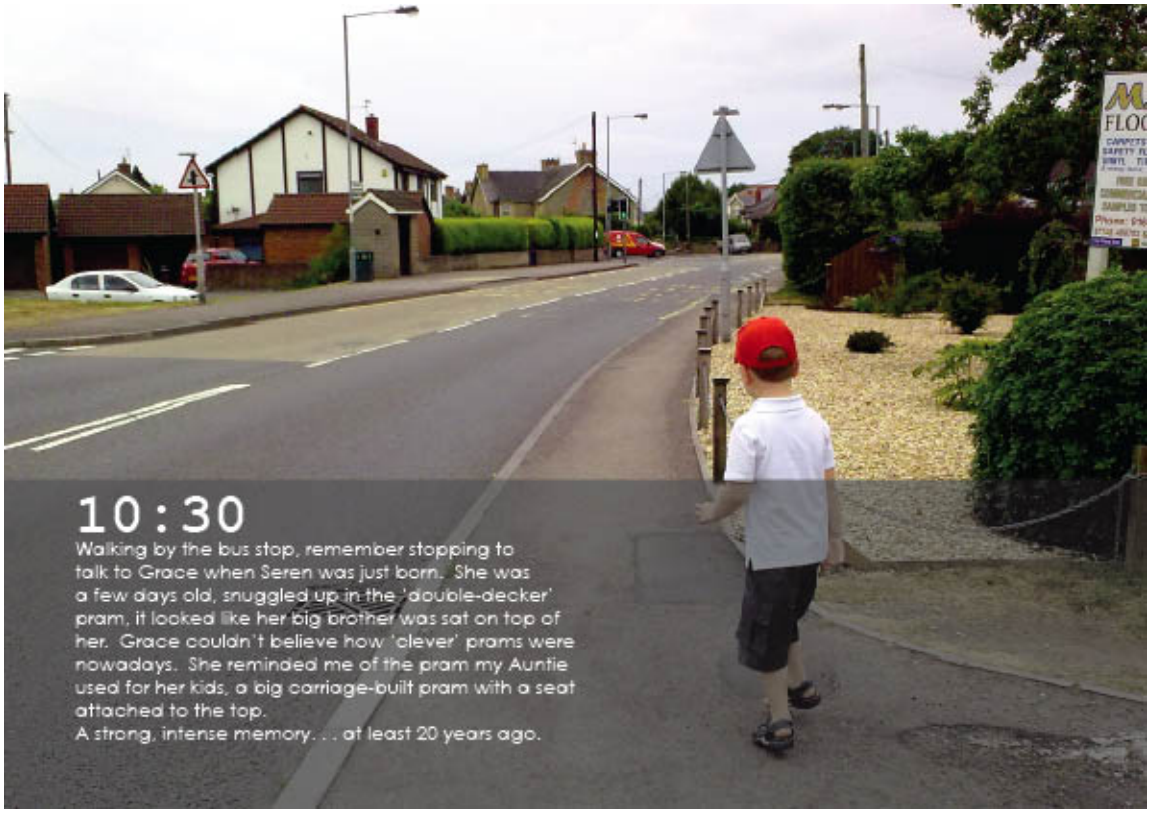

Figure 95: Example of Unexpected Remembering, 10:30

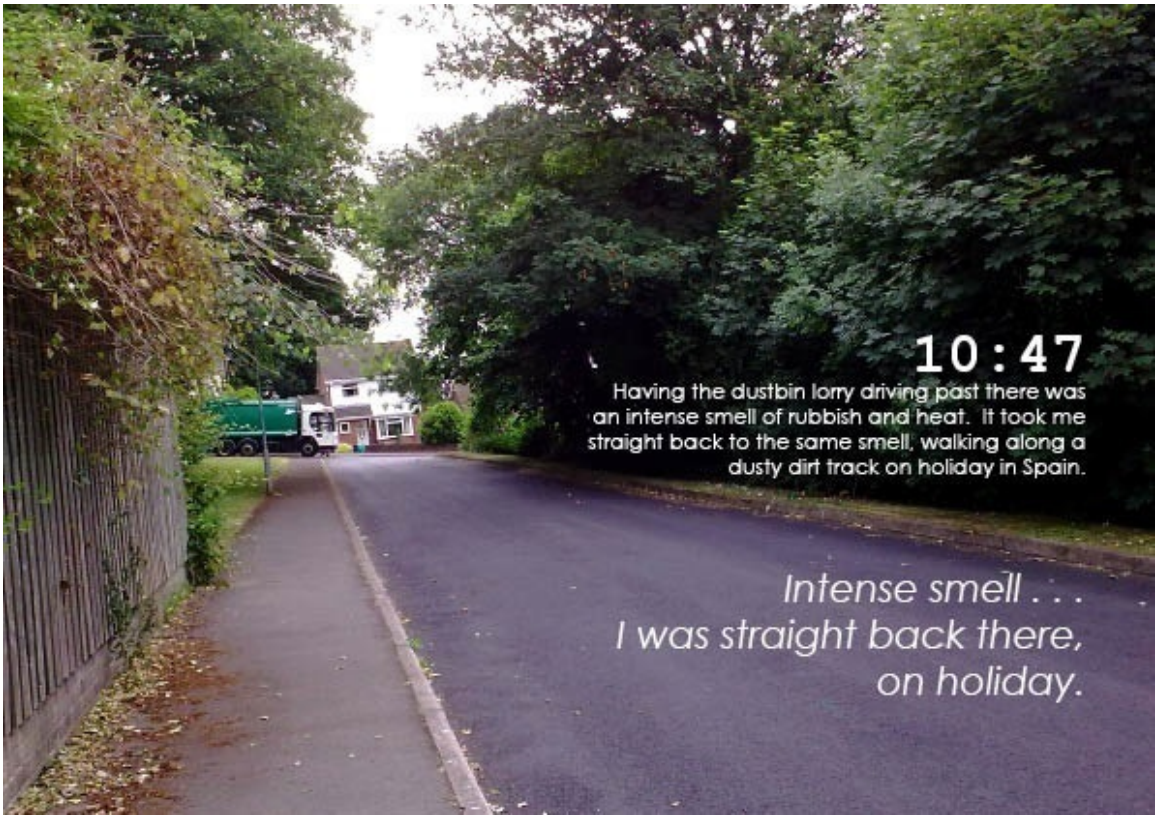

Figure 96: Example of Unexpected Remembering, 10:47

Figure 97: Example of Unexpected Remembering, 11:19

Figure 98: Example of Unexpected Remembering, 18:59

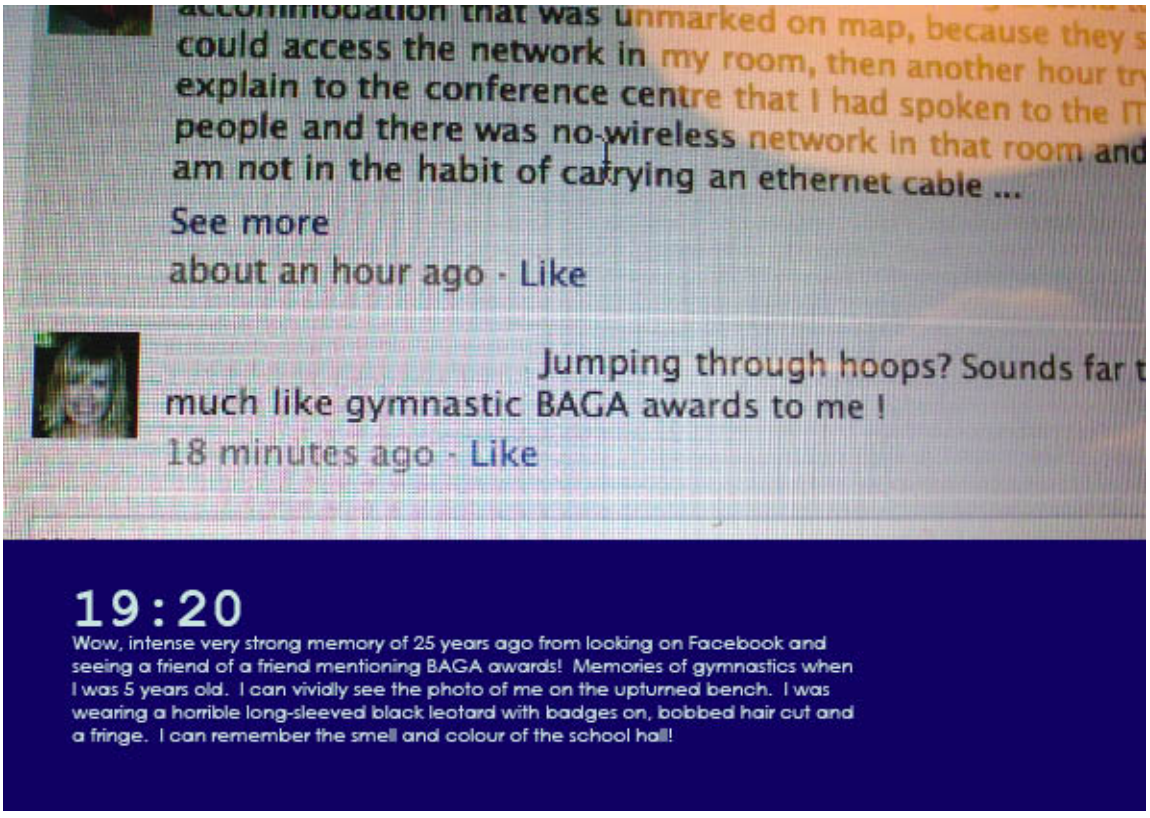

Figure 99: Example of Unexpected Remembering, 19:20

I reflect upon these stronger memories against criteria and theories from psychology, as I did previously (see *Diary Method Trial 2: Record every involuntary memory experienced in 1 day*), theories such as the chaining of memories, the age of the memory, current activity, the presence of triggers, rehearsal frequency and the type of trigger. I consider each memory account against criteria (see *Appendix 4ii: Analysis table*) to show where similarities and theories hold credence, with the conclusions from this exercise as follows.

Age of the memory

Salaman (1982) observes involuntary memory is commonly triggered during low emotional states, whereas the content of the memory is often immensely positive dealing with remote events and experiences a person has not thought about for years. Evident through these examples are how stronger memories are often from a very long time ago, mainly childhood. If childhood memories trigger some of the most powerful involuntary memories, designers might consider this stage of a person's life for inspiration for potential memory triggers.

Chaining of memories

Psychologists (Mace, 2005,2007; Berntsen 2009) often reference the chaining effect of an involuntary memory priming more instances of unexpected remembering, but considering this against my results, there is little evidence. The more intense unexpected memories from the day occurred without any preceding memory recall and not caused by the chaining of memories. However, there is evidence of chaining in the *less* intense memories that day.

Many stem from people thinking about their own memories associated with their children's experiences that day. As stated previously, some people had children starting school and chaining was evident in many memory accounts referencing their own childhood and their time at school.

Less biased results may come from repeating the collection on a day considered more 'routine', to form realistic understanding the effect chaining has on involuntary remembering. However, as chaining was not evident in the ten stronger examples of involuntary memory analysed in the table of results (see *Appendix 4ii*), pursuing this further is of little importance to this research. Chaining, though it does prime involuntary memories, did not appear to cue the stronger memories collected during this study.

Current activity

During the day, stronger involuntary memories occurred when people were in a low-attention state, during un-focused tasks when their mind was able to drift and wander away from current tasks, for example, whilst walking, in the car, in the shower, or waking from sleep. Kvavilashvili and Mandler (2004) call these *semantic involuntary memories* as they occur without any apparent cues whilst attention is diffuse or dealing with unrelated material.

Non-focused attention may enhance the processing of cues (Kvavilashivili & Mandler, 2004) or may simply be because the process which blocks memories from coming to mind during focused states is relaxed during non-focused states (Conway & Pleydell-Pearce, 2000). As a result, design interventions might support non-focussed states in a similar way to discussions in Chapter 3, by presenting potential cues in a person's periphery where it is not seen as a direct invasion of current activity but may encourage reminiscing.

Rehearsal frequency

The most powerful memories recorded on the day had not been triggered for a very long time, if at all, where not having previously accessed the memory heightened the intensity of the recall. The rehearsal frequency of involuntary remembering contrasts greatly with voluntary remembering (Mace, 2004), so where designed support in the past has focussed on voluntary remembering and encouraging frequent rehearsal of memories from the recent past, design might now consider infrequent rehearsal and long-forgotten memories.

Finding cues to memories never before remembered seems an impossible task, but when considering other characteristics of involuntary memories, such as the type of trigger, the age of the memory and current activity, ways of achieving this may become clear.

Presence of triggers

Sensory triggers cued the most intense memories with the majority being either objects or smells encountered unexpectedly. Again[13], this does not support Mace's theories (2004) that abstract triggers, for example, thoughts, language or other memories, cue the most intense involuntary memories. My results indicate the stronger examples are cued from

[13] Supports analysis discussions in my previous study (see: Diary method trial 2 results) that sensory triggers cue more intense involuntary memories than abstract triggers.

sensory triggers, supporting the Proustian view of involuntary memories being triggered by cues met in the environment by chance.

Previously testing the method myself, I felt sensory triggers cueing my memories may have been more prominent due to being a designer, however, finding similar results when sampling a larger group of people with varying occupations indicates this may not be the case. Sensory triggers cued more episodes of intense involuntary memories than abstract ones. For design, this aids potential support; it is easier to design a system that uses sensorial triggers than abstract ones. It is less problematic replicating and hinting towards an object, smell or music for example, than it is to understand the potential cueing of memories from thoughts or other memories.

Type of trigger

The stronger memories were triggered when only a hint towards the original memory presented. In these cases, the trigger was not true to the original encoding of the memory but formed enough of a link to cue remembering, for example, a song from the era cueing remembering of a special event from the same time. This supports a main research theme that original triggers to memories are not always needed to cue long-forgotten memories, so designers do not need to support the keeping of original memory triggers per se. This is hugely beneficial, as it requires far less storage, time and dedication from people to maintain over current memory support systems. I discuss ways design could achieve this in the next chapter.

The results also indicate *smells* trigger very powerful memories. Three out of the ten examples presented describe unexpected memories triggered by very distinct smells. This was identified by Berntsen (2009), Mace (2007) and Proust (1928) as important to involuntary remembering, however, smells can be difficult to replicate when considering designed support.

Overall, discussing the results of sampling more people generally supports the findings from my previous design exploration where I tried the diary method myself. By making similar comparisons in both to criteria used by psychology researchers encourages reflection over the optimal conditions for triggering involuntary memories. Identifying these suggest areas design could focus extended support, which I explore further in the design speculations at the end of this chapter.

Conclusion

There are examples of involuntary memories in everyday situations, as the examples from the design explorations show. Through examples, this chapter provides strong real-world evidence of the powerful and intense emotions unexpected remembering can bring. My approach to explore methods from psychology research for collecting this type of evidence and applying them to my own design explorations proved successful, though different requirements guide them.

Applying approaches from Berntsen (2009) and Mace (2007), and trying them myself, helped refine and ensure the final exploration was a success by emphasizing areas to simplify and ways to make the experience engaging for people. Though the examples collected show some people failing to fully grasp the requirements of recording *purely* involuntary memories, I found they welcomed reviewing their memories in this way; many commenting they had not fully appreciated how often they are unexpectedly reminded of their past each day. These comments offer further encouragement that people are intrigued by, and welcome support for unexpected remembering.

I used criteria set by Mace during his studies (2007, 2005 & 2004) to reflect upon the examples collected from both of my one-day explorations. Comparing these alongside findings from psychology researchers (Schlagman et al., 2007; Kvavilashvili & Mandler, 2004; Berntsen, 1998; Mandler 1994), gives credence for this research offering recommendations based on strong evidence of involuntary remembering. My examples identify clear characteristics of involuntary remembering, with the stronger examples based on very old childhood memories, triggered by hints of a memory cue. Also evident are how important intangible cues are in triggering very powerful episodes of unexpected remembering, for example, distinct *smells* triggering bizarre memories from the distant past never previously remembered.

My purpose for collecting examples has been two-fold: to illustrate the types of memories this research aims to support, and to use them as inspiration for design concepts. The examples demonstrate many conditions conducive to unexpected remembering and in the next section I use them as inspiration to generate new design proposals. The proposals hint at possible solutions to the challenges and offer initial speculation around the emerging themes, such as *state of mind* and *re-appropriating existing information*.

Design speculations

The following proposals are inspired by the collection day results. My approach does not link specific proposals to individual examples, but develops a group of ideas inspired by emerging themes as well as being a summary of the research at this point. They are grouped into the themes: *Untouched History*, *Different Lenses* and *State of Mind*.

Untouched history

The first derives from the *historical* age of memories: a characteristic from the stronger examples where memories lay dormant and untouched since capture. Many of these stem from childhood and produce significant and intense examples of unexpected remembering.

The concept **Memorabilia Post** (*Figure 100*), presents people unexpectedly with items once owned many years ago. The concept is inspired by long-forgotten childhood memories and how forgetting, and then subsequently remembering, triggers powerful memories (Berntsen, 2009; Mace, 2007). *Memorabilia Post* proposes sending items kept in the attic to a service, which redelivers them to their owner sometime in the future.

The concept links ideas around *Schema Theory* and the *Ebay Frame* concept (discussed in *Chapter 3: Clue 'Schema Theory'*), whereby understanding certain categories and schema groups a person belongs to, associated items determined by the system as potentially owned would be sent to the person. Though receiving these objects through the post would be the ideal scenario there could be limitations to its feasibility. A more plausible concept could feature images of these objects sent to personal screens and devices at controlled times, or hints towards them referenced in media adverts, for example.

This concept shows value in the history around memorabilia. Seen during the collection day, people meeting objects or even hints towards them, triggers many instances of strong unexpected remembering. Indeed, of the more intense instances of involuntary remembering it was chance meetings of objects, smells and music that cued the most, supporting proposals, for example *Memorabilia Post* (*Figure 100*).

Figure 100: Memorabilia Post

Different lenses

The next set of designs considers presenting *existing information* differently and through different lenses. Identified during the collection day, rarely does the original cue need to present in its original form to trigger successful reminiscing. New iterations and representations of the original can cause people to notice the novel and remember the past. The first concept **Spending Maps** (*Figure 101*), re-issues bank statements in a new way: presenting data of where people have spent their money as a map of places visited rather than a list of numerical transactions. Visualising this information as a map encourages people to reacquaint themselves with their past through their monetary transactions, by remembering the places they visited and perhaps the people they met. People could find this type of data useful, particularly if maps were issued many years later, making them explorative and purposeful for reminiscing as opposed to the current format of a monthly list of transactions.

The next proposal, **Media Parasite** (*Figure 102*), encourages chance encounters with memory cues, moments such as hearing memorable music on the radio. *Media Parasite* infiltrates media channels close-by, feeding personally relevant information into public spaces. Always carried, perhaps as a key ring, the *Media Parasite* transmits known information about the wearer to nearby public media devices. Publicly available data that has personal resonance, like songs from personal music collections, childhood toys or photos of places visited, could occasionally and randomly appear on nearby devices. Imagine hearing the music video of a song listened to frequently on holiday now playing on the televisions in a shop.

With such a system, designers would need to consider the fine balance between a system that delivers welcomed memory triggers to one that creates an oppressively haunted environment if it happened all the time. The characteristics of intense involuntary memories are that they are the least remembered memories. If systems like *Media Parasite* were developed, designers of interventions need to consider and be sympathetic to this. New memory support systems need mechanisms to control conditions such as frequency, so they support characteristics of involuntary memory alongside goals of enhancing instances of unexpected remembering.

Both concepts show how experiencing information associated to memories differently can encourage reminiscing. Success in re-appropriating information is the subtlety in how it is redelivered so that it is not seen as intrusive and unwelcomed.

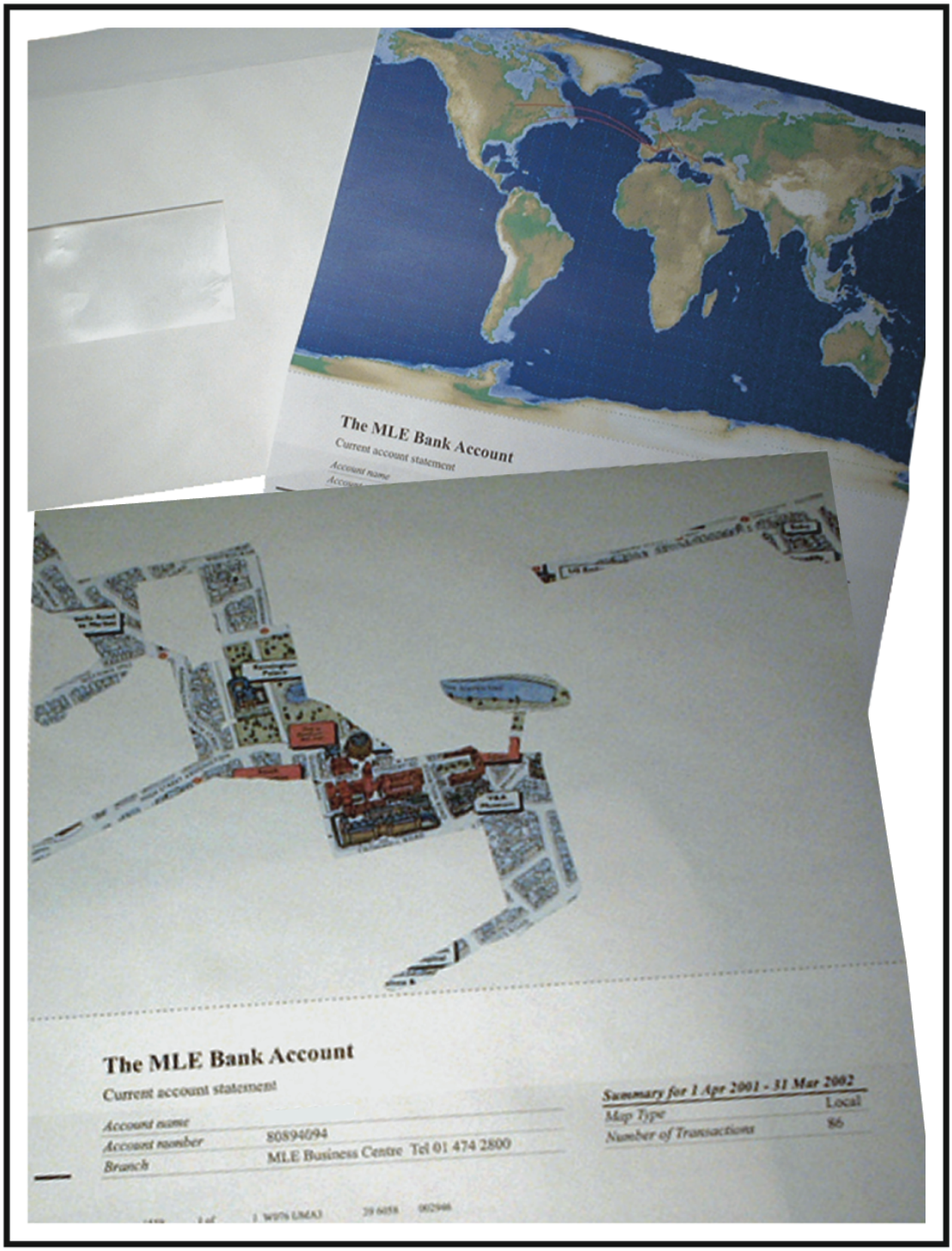

Figure 101: Spending Maps

Figure 102: Media Parasite

State of mind

As well as presenting existing information in new and novel ways, how people feel also impacts on remembering. The final proposals consider the influence a person's *state of mind* has on unexpected remembering. The **Flashbulb Ring** (*Figure 103*) builds connections between stressful situations and triggering memories through association. *Flashbulb Ring's* design links an image of an object shown on the display of a ring to, in this case, a stressful situation. Using galvanic skin response sensors on the palm of the hand to recognise stress from the wearer, triggers the display an object on the ring. When this object, or a hint towards it, is seen again in the future, memories associated to the original encoding would be recalled.

This concept considers how visual triggers might be created and linked to personal memories by designed systems. Through considering designed association of memory triggers to particular events, by recognising stressful experiences and feeding triggers through at encoding, offers many possibilities. Systems creating the trigger to the memory offer huge control to future memory recall. This process may be applied to other situations, where a system recognises emotional or stressful experiences through sensors, presents a sensory 'trigger' for encoding and stores this for future recall.

The final concept, **Souvenir Mantelpiece** (*Figure 104*), considers traits for maintaining access to memories: collecting souvenirs and creating display areas for them at home. However, display areas often become stagnant with memorabilia disappearing into the background and becoming an unnoticed part of the décor. Considering ways to enhance these areas, *Souvenir Mantelpiece* proposes an ever-changing display of souvenirs, aimed at encouraging unexpected reminiscing.

The concept consists of a digital 'mantelpiece' in the living room displaying images of souvenirs. The display is controlled by the location of a GPS device, with current location sending images of associated souvenirs to the display. Imagine relatives or friends away from home carrying this device sending souvenirs of their travels to the mantelpiece, like sending a postcard home. Similarly, the homeowner could permanently carry the device as a key ring, automatically collecting mementoes of travels, feeding the display with souvenirs of places visited each time the device returns home. Designing the display around the form of the mantelpiece takes advantage of existing interactions with this space, thoughtfully displaying objects in the focal point of the room, where designing for this space may influence and prompt people's actions and conversations in a place they typically go to reflect, relax and socialise with others.

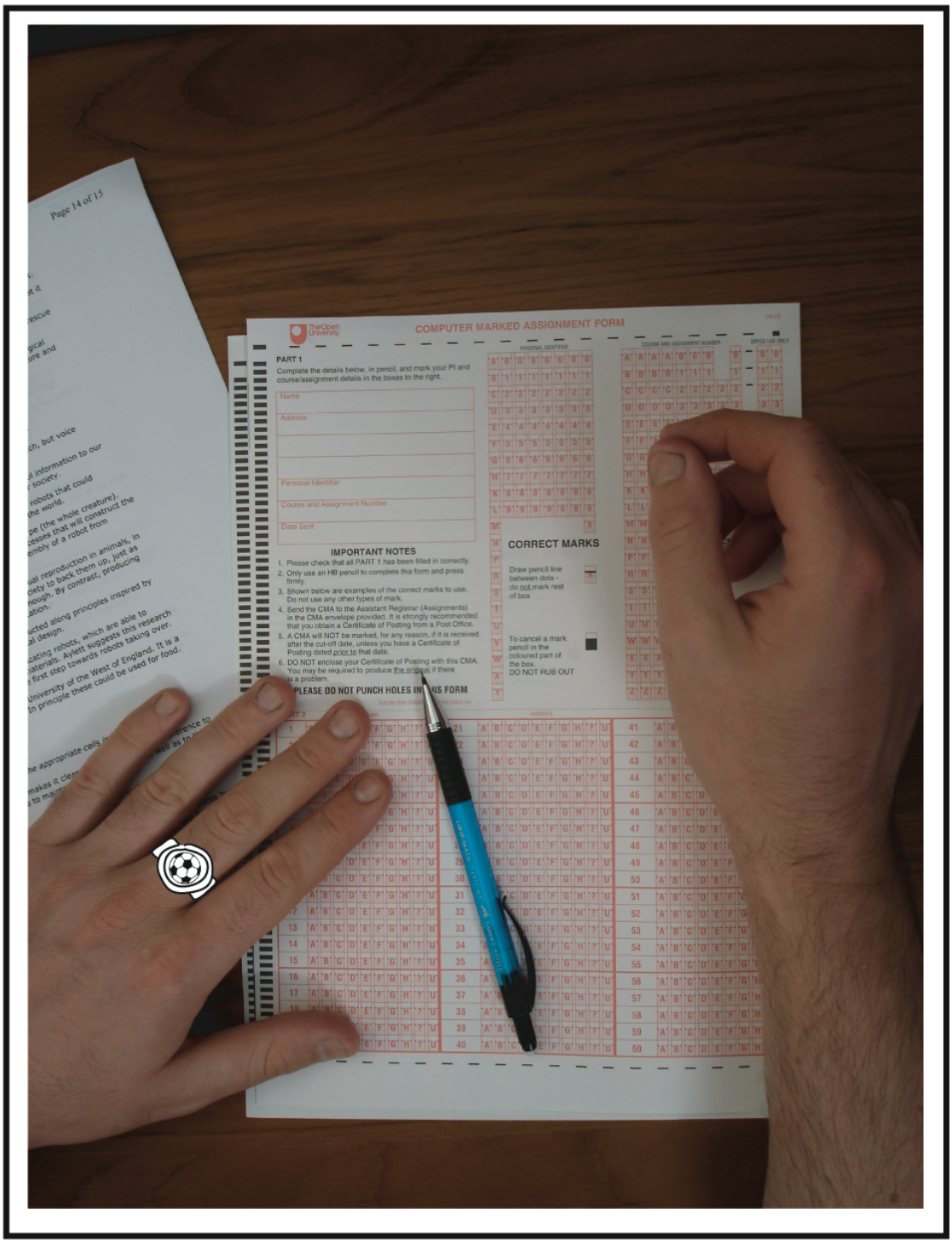

Figure 103: Flashbulb Ring

Figure 104: Souvenir Mantelpiece

The stronger examples from the collection day identify general themes around involuntary remembering and the design proposals show how designers might develop supportive interventions for them. The themes emerging broadly characterize the optimal conditions for strong involuntary remembering, including the age of the memory, current activity, presence of memory triggers and rehearsal frequency. My proposals touch upon these themes, which I now summarize.

The *age of the memory* is significant in producing intense unexpected remembering, where older memories produce strong powerful remembering. This can be heightened further when not remembered often. The *Memorabilia Post* concept couples low *rehearsal frequency* with long-forgotten memories from childhood to potentially trigger strong memories. This concept also draws on another theme, *memory triggers*, where presenting triggers or hints to these during optimal conditions support unexpected remembering. Other concepts highlighting the importance of memory triggers are *Souvenir Mantelpiece* and *Flashbulb Ring*, though each for different reasons.

Souvenir Mantelpiece considers memory triggers against rehearsal frequency and a person's state of mind. Souvenirs are often collected from memorable places, where their role in triggering future reminiscing is determined by exposure. This concept takes that control away from the individual with the system fully managing the collecting, frequency and exposure to the memory trigger. The concept draws on reflective locations, periphery information and over exposure of memory triggers to suggest alternative and novel ways to unexpectedly create and display memory triggers.

Flashbulb Ring creates links between objects and memories at the time of encoding so that future remembering may be cued when hints to the trigger are presented. The concept draws on *activity* and *state of mind,* and uses this as the mechanism to trigger future reminiscing by matching conditions at encoding with when they occur again in the future. The concept considers bizarre relationships between objects as memory triggers, and the designing of interventions around optimal conditions as key to extended reminiscing.

The collected examples of unexpected remembering confirm original memory triggers are not always needed to cue remembering, just hints towards them. Supporting this, the concept *Spending Maps* presents existing information in new ways to encourage reflection and reminiscing. Re-appropriating information, such as bankcard spending, in this way encourages additional remembering around the transactions: the places visited, purchases made and people associated.

Finally, a person's *activity* and current focus can influence remembering. More unexpected remembering occurs when people are in non-focussed states, whilst performing autonomous tasks with their mind receptive to processing additional information. The *Media Parasite* proposal demonstrates this; using electronic devices in transient spaces to present potential memory triggers, based on a person's history.

Many external factors influence the intensity of involuntary remembering and, as the design proposals show, there is not one method or set of rules to design for this. Instead, themes and considerations are emerging that designers can take inspiration from and I conclude these as a final set of recommendations in the next chapter.

CHAPTER 5

The re-appropriating approach:

Creative treatment of memory

Introduction

I use this chapter to develop the theories and my reflections from this research into a final set of recommendations for how design can support unexpected remembering. These recommendations introduce spaces for design that bring together the ripe conditions and criteria highlighted by the theories, tested in the design explorations and considered in the design proposals presented throughout this research.

The research claims value in encouraging memories that are random, involuntary and autobiographical, where delicacy in design interventions are important in creating experiences sympathetic to how involuntary memory normally occurs. This chapter suggests ways designers can use the nature and characteristics of memory (discussed in previous chapters) to consider and design completely new ways of collecting, delivering and consuming evidence of personal memories. To do this, my research indentifying value in triggering personal memories through impersonal content is important.

The prime examples of involuntary remembering occur *away* from interaction with personal content (see *Chapter 4: The Successful Results*), whilst people go about daily activities, and coming into contact with hints to personal memory triggers met randomly. The final recommendations focus on re-appropriating existing information and databases of impersonal content into new spaces for discovering and creating moments of unexpected remembering. The *practice work* explores the themes presented in each approach through design proposals, and uses content from databases readily available to illustrate how re-appropriating existing information stores might evolve.

The overall suggestion for designed support considers treating the evidence of people's memories as a *resource* as they have value to others in triggering their memories. This develops across the recommendations, where I explore key aspects that help designers understand the conditions and situations conducive to involuntary remembering and where potential support should lie. I present these and offer creative recommendations, considerations and inspirational spaces that designers might explore to support involuntary remembering further.

Approach:

Evidence of memories as resource

My first approach considers the evidence people collect of their memories as a resource: the value of our personal memories to other people, and other people's memories to our own. As an approach, designers might treat personal memories like a 'commodity' as a marketable item that satisfies a particular want or need, in this case personal remembering, and support ways of 'trading' or 'exchanging' them between people through the design of new services or systems.

This treatment of people's evidence of memories as a resource scopes the space and overall direction taken with my recommendations and maps the background theme for the three specific directions that follow. All stem from this initial understanding of people's representations of past events having value to others. There are aspects to considering evidence of memories as a resource that need addressing: an understanding of the term, the value of treating this evidence as beneficial to our own personal remembering and other people's, and how this approach translates into a model of support for unexpected remembering.

In designing for memories there are problems with creating a system that is accessible to all, especially when memories appear unexpectedly and randomly. A solution is to consider times when a person's memories momentarily lose individuality, when they are shared and consumed by other people. An extreme fictional example of this and the 'commoditisation' of memories can be seen in the film *Strange Days* (1995), suggesting a time where memories are sold as an illegal form of visual narcotic. The film proposes a demand in the future for extreme tastes of reality where people record 'home video' experiences through devices worn on the head. In this future scenario experiences are sold on and taken like a drug, where other people's memories become a form of addiction as people buy into 'wire trips': memories that can be played back again and again. Available on the black market, these memories circulate as a commodity, for monetary gain.

Though presented as a future scenario some current systems, for example, *Facebook* and *Twitter*, draw similar parallels with people contributing evidence of personal memories to online information stores, accessible by others. In these present-day

examples, data becomes valuable and engaging as other people interact, and potentially spark off other people's remembering of their own memories.
The process of sharing memories, through small reminiscing episodes with friends and family, or large-scale newsworthy events and societal remembering, gives memories a 'consumable' value. Sharing acts as a catalyst as hearing other people's memories often triggers our own, and by looking at how evidence of memories are already consumed under various guises, their value and how it can be used as a resource for design warrants further exploration.

Other people's evidence of memories: A resource for us

Using other people's memory evidence for our own benefit to trigger our own memories, offers great opportunity for designed support for unexpected remembering. Finding ways to extend these will offer new design spaces to explore but first, understanding where and how this occurs, and the exchanges that are made, are important.

Discussed previously (see *Chapter 1: Visiting Memories*), hearing other people's memories often cue our own, so for design, settings around conversations with others might be developed further to use, market, exchange and consume evidence of memories beyond current means. To do this, I suggest designers might consider some of these existing consumption models, for example, online services and social media websites.

Networking sites (Facebook and LinkedIn) promote displaying and sharing information about someone's life offers chance for other people to explore. Other online blogs (Twitter), social news networking (Digg and Leakernet), photo sharing (Flickr and Instagram) and content communities (YouTube and DailyMotion) offer more opportunities to access other people's generated content, all of which have relevance to personal reflection and can initiate remembering.

Online user-generated collections provide interfaces that allow visitors to engage and consume through other people's preferences. This is evident with music sites such as *Spotify* and *Last.fm*. Though primarily developed for commercial gain, as a channel to deliver relevant music and directed advertising, an upshot is their ability to spontaneously cue personal memories through the creation of playlists. Playlists and listening experiences become generated through themes (genres, moods and eras for example), and designers might explore similar systems as inspiration for new offerings.

The spaces discussed create a sense of communal memory and ownership even though they develop around another person's memory archive. People's online

information and preferences already contribute to vast data stores, with filters and classifications applied through personal preferences. By reconsidering these stores as a resource and valuable to accessing our memories, ways of trading and exchanging them can be investigated to find new avenues to support unexpected remembering.

Our evidence of memories: A resource for other people

People collect and store information daily by interacting with social media websites and generating data about our personal lives through commenting on current activity, taking photos and listening to music, for example. All produce databases about who we are and what we are about. As many people are accustomed to collecting and creating this data as part of daily life, this information forms evidence of potential memories and life experiences. Advances in technology have made this purposeful archiving of personal information easy and routine (as discussed in Chapter 2), but important is how this information might be used to offer valued memory support. I propose that designers use these personal databases as a resource to ask questions and find new ways to explore remembering.

Information about people and their digital existence is freely available through the right channels (for example, *social media* and the *Freedom of Information Act*) for re-appropriation and developing new models of consumption. Already, publically available databases of information have the potential to cue personal memories; conducting a simple search for images on the Internet around a theme produces a raft of potential memory cues and this could be extended to present such information in situations appropriate and relevant to reminiscing.

Contributing to official registers like *Census Records*, *Electoral Roll* and *General Register Office,* and with the collection of *Big Data* about people's digital presence, the preferences and choices people make generate valuable information and form the building blocks for marketing companies and national brand loyalty cards (Zelin, 2011). Customer-focused companies might consider it a commodity when developing marketing campaigns and customer experiences, but this type of information is also useful to this research as a way of understanding more about people's potential memories. With significant investment and research into Big Data (for example, The White House Big Data Initiative committing money to big data research, the EU's Big Data Public Private Forum engaging companies and academics in discussing big data concerns, the British Government's Alan Turing Institute investigating new ways of collecting and analysing large data sets, the

British Research Council's Big Data consortium funding new research and the King's College London Digital Humanities Group exploring big data issues), the benefits of analysing digital information to understand more about people is valuable to finding ways to deliver information appropriate and relevant to people's memories. Cote (2013) of King's College has embarked on research to look at "how we might generate widespread community value out of the social data we generate through out mobile devices and other mediated communicative practices." Partnering with the Open Data Institute, they will consider how to turn 'big social data' into open data and empower the digital human and create new data communities. The privacy around using such data to infer personal relevance will always be contentious but the potential it brings to ensuring support is appropriate and warrants further exploration.

Chris Downs' work, *Loome* (Black, 2002) explores the value of someone's published personal information. He brought together data automatically collected and stored about him by companies and used it to trade information about himself to other companies, sharing in the commodity value of his personal data. Similarly, people could use this type of information for their own reflection and I discuss this in the *Spending Maps* concept presented previously (see *Chapter 4: Practice Work*), where information from money transactions produce bank statements as photographs and maps designed specifically for reminiscing. Considering these examples, other services using similar stores of information might offer additional opportunities to create new narratives for consumption.

An approach for design

I explore the themes discussed around using the evidence of other people's memories as a resource for triggering our own through a series of design proposals (*Figures 103-106)*. These proposals illustrate the potential when designing interventions that support this approach, identifying how current experiences might be enhanced and offering inspiration to explore more offerings.

The first proposal considers the value others people's evidence of experience has on our own remembering. The **holiday window** (*Figure 105*) uses a digital photo frame to display other people's holiday photos from online social media databases. The frame has an interface that allows users to determine the accuracy and relevance of the photos to places they have visited. This allows people to choose places they have visited for more predictable reminiscing; otherwise a 'wanderlust' option offers exploration of new vistas.

This window to other people's holiday photos supports the value of other people's evidence of memories in triggering our own, in this instance through having been to the

Figure 105: Holiday window

Figure 106: Car boot coffee table

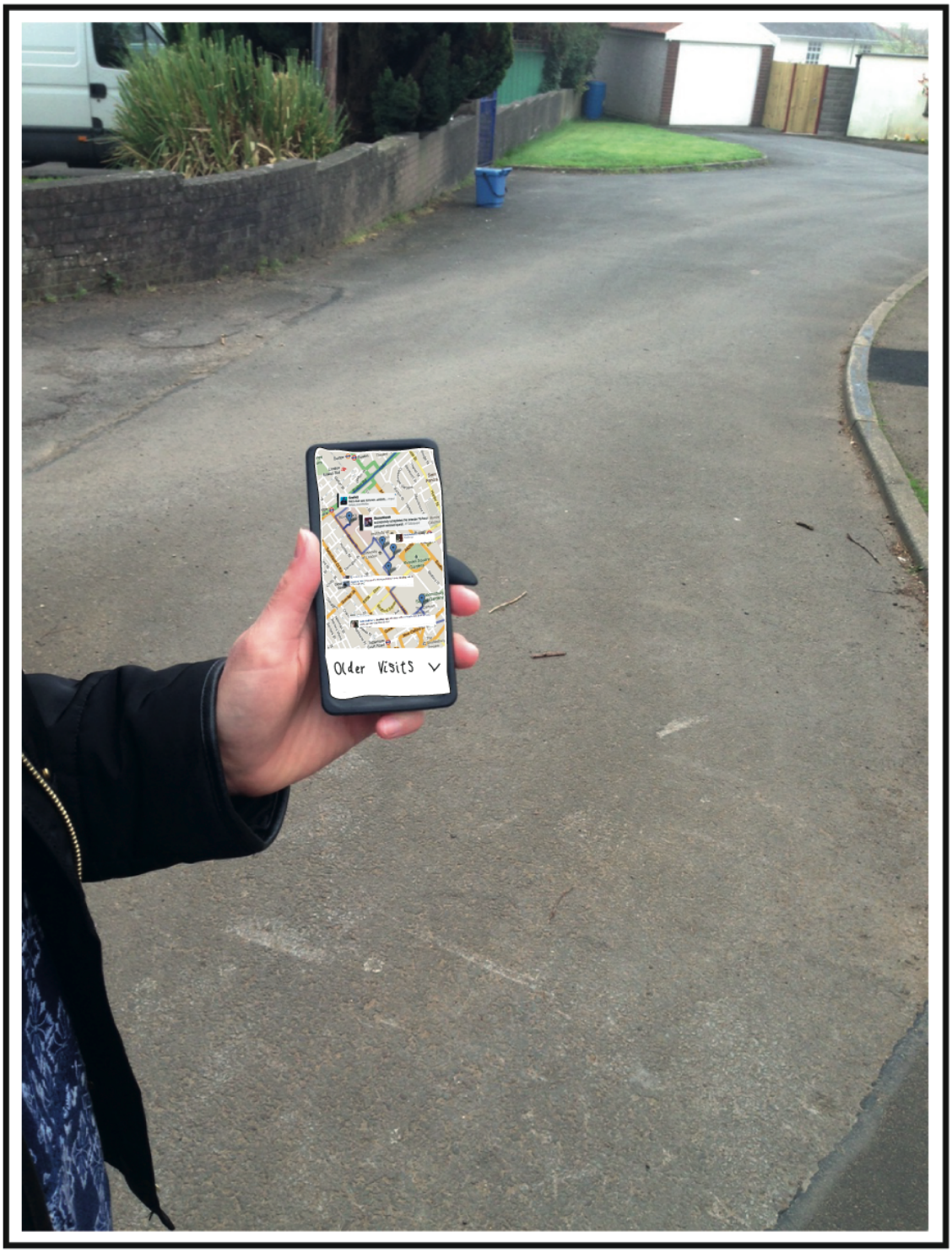

Figure 107: Geo talk

Figure 108: Twitter boxes

same place or offering opportunity to reflect on our own holidays and similar experiences. The next proposal, **car boot coffee table** (*Figure 106*) displays items currently for sale on online second-hand selling sites. The table has a display beneath a glass top that haphazardly displays items on the screen, similar to tabletops at car boot sales. When used as a coffee table, having the display beneath ensures it becomes obscured at times and offers limited views that warrant physical interaction for further discovery. The items appear on the table when listed on an online selling site (such as eBay, Freecycle or Oxfam), disappearing as they are sold. This produces a frequently changing, evolving and chaotic display of many layers. Similar to a car boot sale, the objects on display offer occasional triggers to memories, where living with the display over time is likely to offer many unexpected discoveries of forgotten memories.

The **Geo talk** concept (*Figure 107*) uses the social media statuses people post about locations visited as a collection of reflective prompts, offered when visiting the same place. The device automatically collects comments tagged to a location when passing through and displays them on a map interface, showing the places visited through comments left by others. The comments offer background prompts to the day's travels that may prompt remembering, building a history of the places visited for future access. They may take the form of descriptions about landmarks, personal achievements or reflective thoughts and feelings that are less location-specific, offering new perspectives on the places visited; undiscovered aspects and new understanding of the place may prompt additional reflection from being there.

The final proposal, **Twitter boxes** (*Figure 108*), takes tweets posted to twitter accounts and displays them individually in boxes, where people's interactions with these boxes determine the tweets received. Adjusting the aerial on each box changes the tweets from people known when the aerial is down, to strangers nearby as the aerial is extended and the box searches for local conversations. With boxes brought closer together, search filters look for related tweets and those with similar subject discussions, allowing comparative reflection and understanding around topical themes. Giving this type of content a physical space in a domestic setting encourages people to reflect upon the information differently, and offering simple interfaces to filter this content makes new connections and spaces for exploring and imagining.

The proposals show how design might encourage new unexpected ways of remembering by considering the evidence of memories as a resource. Executable ways of

doing this include re-appropriating the large amount of personal information that already exists about each of us for the value it has in triggering our own memories and other people's. Discussing evidence of memories as a resource shows how treating this type of information as a consumable and marketable 'product' highlights new spaces and exchange models to explore. To do this, designers might consider three core approaches: the value of using other people's memory information to trigger our own (prosthetic memories), the generic memories everyone has (universal memories), and people's ability to take personal relevance from impersonal information (power of imagination). I explore each separately, as detailed approaches.

Approach: Prosthetic memories

This approach specifically focuses on using other people's memories to encourage one's own. People commonly hear another person's memories, or see evidence of memories, where they willingly interpret, reflect and respond with their own experiences and associations.

Though *prosthetic memories* originally defined the impact of mediatised 'memories' on the audience (Landsberg, 2009), I extend the use of the term in my research to describe the impact and influence of other people's memories, taken on during frequent, smaller exchanges of information. The characteristics of prosthetic memory make this approach beneficial and valuable to supporting involuntary memory, as by its very nature of belonging to someone else, potential memory cues are likely to be received unexpectedly. To investigate this further, there are different aspects of prosthetic memory I explore, such as its source, presentation and consumption. First, I consider the origin of prosthetic memories and the conditions that cue remembering around them.

Sources of prosthetic memories

Prosthetic memories develop from different sources: from a need to share recollections of our personal past to a public interest in the reporting of societal and historical events. Investigating how other people's evidence of memories and reminiscing find their way into our consciousness may offer designers ideas around how experiences can be enhanced.

Many examples of prosthetic memory exist, from shared reminiscing in conversation with others, to viewing acquaintances evidence of memories on social media sites. Other specific uses, such as reminiscence therapy sessions (see *Chapter 3: Personal*

Public Histories) demonstrate the benefits of sharing other people's memories when used as a purposeful therapy, but all show people's ability to interpret and reflect upon someone else's memory accounts through cueing their own associated memories.

There are implicit examples of prosthetic memories where other people's personal information offers up reflective opportunities, examples where memories may not be explicitly told but assumptions and interpretations made for the same purpose. This too benefits unexpected remembering as described in the reactions of the users of the *Photostroller*.

The Photostroller (Boucher et al., 2010), developed by the Interaction Research Studio at Goldsmiths, presented older residents of a care home with categorized images drawn from the Internet (*Figure 109*). Showing a continuous stream of images, a handheld device allows the viewer to filter the images and choose from different categories, deciding how closely linked the images are to the category or whether more random and less related images are introduced. The designers likened it to an 'electronic daydream,' where they found people reminisced through random, never before seen photos.

Figure 109: The Photostroller, by the Interaction Research Studio (Goldsmiths, London), was used by residents of a care home to explore a variety of images drawn from the Internet. (Source: www.gold.ac.uk/media/Photostroller.pdf)

Though reminiscing was not a particular aim of the device, it encouraged reflection on past memories through the images presented and engaged people in general conversation over what they saw and admired. The device shows the value in using impersonal content and tapping into existing databases of information, and is a good example of how designers might introduce ideas around prosthetic memory to trigger personal memories. Presented in situations favourable for reminiscing, devices like the Photostroller can encourage people to imagine and explore their memories by viewing impersonal content.

Larger-scale examples of prosthetic memories are also significant to this research, where remembering originates around important events triggered by societal and communal memories. These may stem from other people's reactions to events presented publically, to personal accounts experienced and shared with others. I consider this aspect of prosthetic memory because of the importance such events have in shaping and influencing the memories of large groups of people. Princess Diana's death is a prime example of how flashbulb memories develop with people having strong vivid memories of what they were doing when they heard the news, though subsequent understanding and memory formation become largely based on the images and facts reported in the news. Other people's first-hand accounts and evidence of being there reported in the news, ultimately influences our understanding and formed memories around these societal memories.

Having identified different sources to prosthetic memory, such as personal autobiographical reminiscing between acquaintances to shared remembering of historical events, I now consider how the presentation of prosthetic memory impacts on our own memories.

Presentation of prosthetic memories

Appearing at two levels, presentation for *individual* consumption and presentation for *public* consumption, there are challenges and benefits of each. I begin by looking at the small-scale presentation of prosthetic memories, where information is presented directly to an individual for solitary interpretation and consumption.

As prosthetic memories present daily through interactions with other people and devices, designers could look to extend these experiences: situations such as being engrossed in a telephone conversation, meeting friends socially or unexpectedly seeing an acquaintance whilst out and about. Services could be introduced to enhance chances of prosthetic memories sparking our own memories in such situations. Imagine seeing glimpses of an absent friend's 'generic' holiday photos on nearby displays, or historical

newspaper headlines and quotes delivered on personal calendars. These discoveries might influence current activity and thoughts or prime near future reminiscing at more appropriate times.

As souvenirs and collections serve as extensions of the self, as physical markers to our personal histories, designers might view these objects as prosthetic memory containers and consider what happens when they change hands. New owners could be offered chance to experience prosthetic memories from previous owners through design interventions[14] where design facilitates the discovery of this information. Though personal memory information presented to strangers in public may cause different reactions to the same information freely shared with friends and family. Jayne Wallace's conceptual jewellery (Wallace & Press, 2004) publically presents personal evidence of memories. *Sometimes I forget to remember* (*Figure 110*) is a piece of crafted jewellery that projects memorable images onto digital displays close to the neck piece, where "the surroundings appear to be paying particular attention to the wearer; the locality is literally acknowledging something personally meaningful, these moments are for and about the wearer" (McCarthy et al., 2005).

Figure 110: Sometimes I forget to remember, by Jayne Wallace, is a necklace able to communicate personally relevant silent image sequences randomly onto near (public or private) digital displays.

[14] Experiencing aspects of a previous owner's memory has previously been discussed when exploring *second-hand memories* (see *Chapter 1: Practice Work*).

In this proposal the owner becomes the audience. The images are a catalyst to the wearers own unexpected personal remembering, but also draw on aspects of prosthetic memory by inviting strangers to interpret and reflect upon the displayed images. This act of 'making public' pushes a persons understanding and remembering of a memory away from the individually preserved version, sympathetic to the original encoding, to one infiltrated with other people's comments and reactions. Presenting and publicising evidence of memories this way creates a system ripe for abstraction and misappropriation by others, whether the public display of personal information is aimed at the owner of the original memory or a stranger, encouraging additional association and interpretation.

The images presented in Wallace's work are significant to the wearer and reference objects once treasured, relationships with others and dreams, but appear so abstract and ambiguous they may cause little reaction beyond the person they belong to. Although they form a prosthetic memory to others, the presentation may be too subtle to provoke reactions in passer-bys. As well as the scale of presentation (public versus private), the method of presentation (subtle versus deliberate) would seem to determine the uptake of prosthetic memories triggering our own, as seen here.

Jacobs et al. (2003) discuss other ideas around the 'parasitic personalisation of public spaces' by building tools for creating personal traces on public spaces for other people to find. They present ways people can personalise public spaces with designed interventions acting as agents and facilitating new ways of leaving and revealing information. In analysing their designs, Jacobs et al. remark on the feelings of personal intimacy people experience when seeing this information in public, and how the perception of place changes through interaction with the device.

Receiving information from devices in public spaces is also proposed through digital billboards in the film Minority Report (2002) and several of Philip K. Dick's books, including one on which the film is based. These billboards speak directly to passer-bys and are described by Palmer (2003) as 'surveillance-meets-marketing' where advertisers customise their message to the individual. This customising is common practice in advertising (*Figure 111*) and people are able to filter this information to extract the personally meaningful content.

When presented with personal information publically amongst a plethora of irrelevant information people are likely to notice it, and considering these examples, designing for prosthetic memories in similar spaces for all to experience might produce good instances of unexpected remembering and should be developed further.

F*igure 111:* 'Minority Report' style billboard, by Clear Channel UK, delivers customised adverts to passer-bys. (Source: www.marketingmag.com.au)

Consumption of prosthetic memories

There are two ways of consuming prosthetic memories: as a memory not lived through but taken on because it is mediatised (like societal memories and historical events), and through the influence another person's memory has in spurring on our own. Taking ownership of another person's memory as our own lived experience can be seen in large-scale, public presentations, forming a sense of collective remembering. This exists in the public realm through media channels like film, television, books and social media websites, and reflects the first coining of the term by Landsberg (1996), where other people's memories influence and blend into our own with blurred boundaries, to the extreme of people being unaware of taking the prosthetic memory on, and developing an element of false memory.

In film theory, 'prosthetic memory' describes the platform film provides for audiences to receive other people's experiences and memories in ways they can empathise, feel and respond to the experience as if it were their own. In exploring the consequences of prosthetic memory, Landsberg (1996) discusses how they "have the potential to generate something like public spheres of memory" (p. 25). This is heightened in societal remembering of poignant events and the creation of memorials to physically anchor remembering within the public space (Kosem, 2007; Middleton & Edwards, 1990).

Cinema and television often present someone else's memories in shared collective experiences that audiences 'buy' in to: imaging, interpreting and drawing on the narrative through their own experiences. Identified by Landsberg (2009), people make use of these new manufactured memories that no one owns, but all can experience.

> While social and economic modernization disrupted traditional forms of community and lent a new urgency to the transmission of memories, the birth of the cinema and other mass cultural technologies produced an unprecedented circulation of images and narratives about the past, making possible a portable and non-essentialist form of memory. In this context, it became increasingly possible to take on memories of events through which one did not live, memories that despite their mediated quality, had the capacity to transform one's subjectivity. I call this phenomenon 'prosthetic memory.
>
> (Landsberg, 2009, p. 221)

Although originally used to define this impact on audiences, I extend the use of the term to consider the impact other people's memory information has on a much smaller everyday scale. People frequently talk about past experiences with other people, with sharing cueing memories for the listener as well as forming new collective memories, where this exchange and its effects has become 'broader and quicker' through social media (Hirst & Echterhoff, 2012).

Other people's memories offer chance to engage in a dialogue of cross-cueing where someone recalling and relaying memories extends and enhances the conversation, and encourages the reshaping of our own memories. Consider reviewing other people's holiday photos through their social media accounts; they may cue memories of a similar holiday, but these cues could be presented in other ways or at times when conditions to remember unexpectedly might be heightened. A design proposal could see the same information and a 'system' understanding aspects about our past, triggering a postcard received in a convivial way that promotes direct reflection through suggesting evidence of having been somewhere.

An approach for design

In the following design proposals (*Figures 112-115*) I consider some of the themes discussed around prosthetic memories, using the proposals to identify ways designers might approach the subject.

The first proposal, **Trending shelf** (*Figure 112*), takes the physical properties of memorabilia objects as access points to additional information stored in online databases. Speed et al. (2012) explored similar when considering the shopping experience in second-hand retail stores and designed ways to include provenance information about the objects

Figure 112: Trending shelf

Figure 113: Facebook frames

Figure 114: Café talk

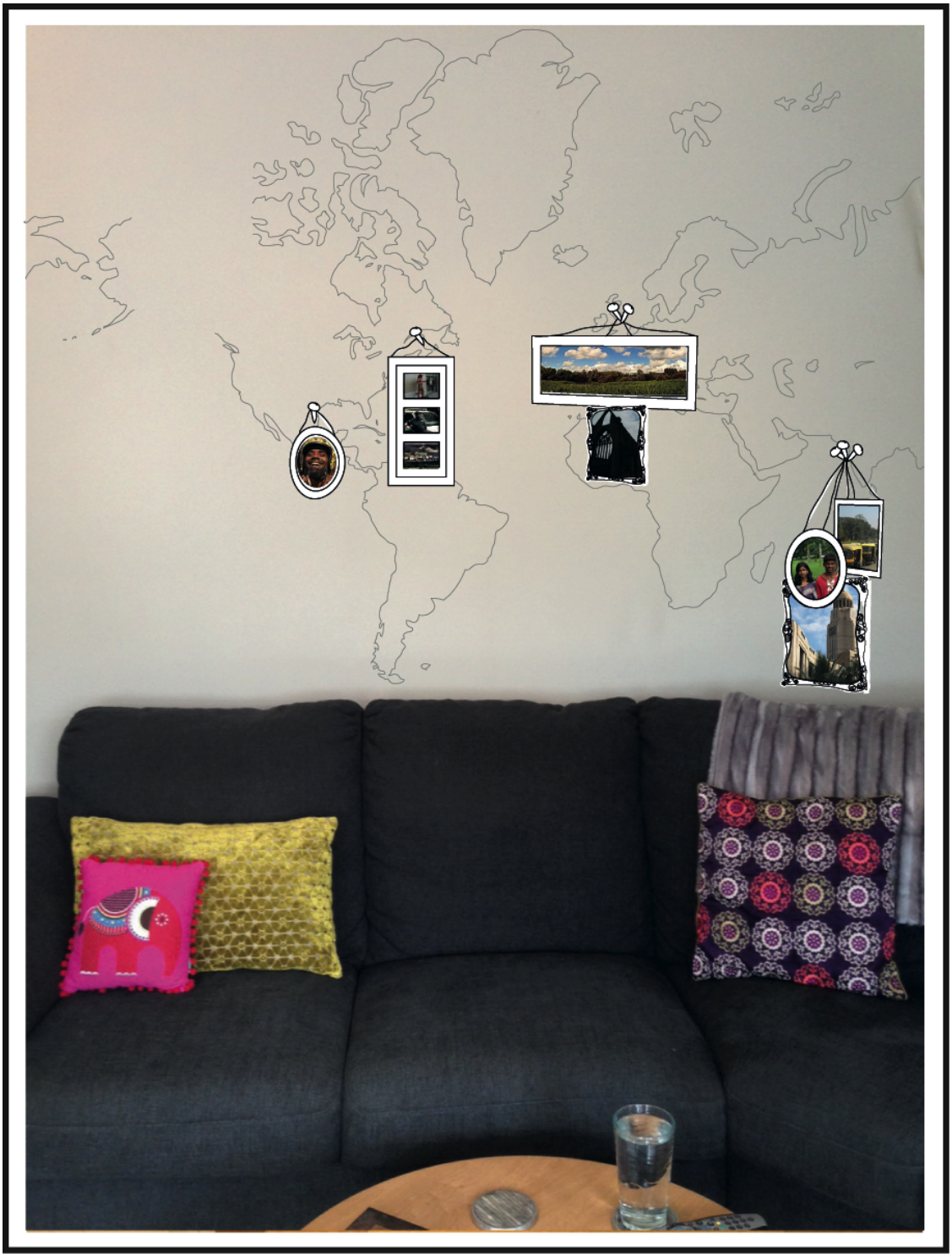

Figure 115: Flickr world map

for sale. Collaborating with Oxfam and launched under the brand 'Shelflife', QR codes

were added to objects for sale in 10 Oxfam shops that linked them to video stories about the item from its previous owner.

The value of additional information associated with objects to personal remembering can be seen in my proposal, Trending Shelf, considers how memorabilia objects are often kept as physical markers to personal memories but when on permanent display, over time they may loose their ability to cue memories as they become almost unnoticed. The trending shelf takes objects placed on the shelf and gives them a refreshed display by searching for and displaying recent digital content based on key words associated with each object. This content may come from current news stories, comments from recent visitors or similarly related information. Displayed on the front of the shelf in a ticker tape-like display feed, other people's discussions and news around the object's current significance might prompt and refresh our own associated memories.

The next, **Facebook frames** (*Figure 113*), offer a collection of 'windows' into acquaintances' social media accounts. Having these displays framed and hanging on the wall provide new ways of interacting and reflecting upon other people's information. Walking past a frame currently displaying a photograph of a distant relative at graduation may interrupt and influence current activity, perhaps more so than seeing the same photo in it's intended online social media interface when time has to be purposely allocated to accessing such information. Frames on the wall provide background prompts to personal remembering that in their static, unconnected form becomes unnoticed over time as they blend into the décor. Facebook frames are different, offering constantly changing displays similar to the qualities of digital photo frames, ensuring they are noticed with many opportunities for unexpectedly cueing personal remembering.

The **Café talk** proposal (*Figure 114*) uses café tables in different locations to feed information about each other's conversation to encourage reflection and potentially influence conversation. Each table has a microphone and display, and mutually share their spoken conversation, abstracted as related images. These images are created by the system collecting keywords from conversations and converting them into an online image search. The resulting images are sent to the display on the other table, and vice versa.

This concept explores the influence of other people's conversations on our own personal remembering and how this could be extended to influence conversations in other spaces. Could such a system encourage more episodes of unexpected remembering or would they be too far removed from current context? The idea might extend to offer multiple choices of tables to link to, where people could explore tables for topic inspiration. As a result, tables might be used less as background prompts and more as

conversation starters.

The final proposal, **Flickr world map** (*Figure 115*), illustrates how an existing database of information that uses keyword filters to search for information can be re-appropriated to trigger personal memories. The proposal consists of a large map of the world on the wall of a person's home with repositionable display frames. Using the frames, people are encouraged to create a collage of discovered photos from around the world by moving the frames over the map. As places are chosen the system recognises the frame's location and collects photos from the Flickr website tagged to that place.

With different styles of frames, the system offers additional search filters to location, such as photos tagged as family, wedding, anniversary, university, school, holiday etc. Using the system, people are likely to choose places and filters with personal resonance; places they studied, family holidays, architectural landmarks. Though the images displayed belong to other people, it is possible to imagine the users own personal memories being triggered from seeing such photos.

Through these proposals and the themes discussed, prosthetic memories, through different scales of presentation and consumption, emphasise the overriding theme of the recommendations; other people's memory information can be, and are already seen as valuable to our own memories and promote many instances of unexpected remembering. Designers considering how, why and where prosthetic memories occur will be presented with spaces in which to design enhanced experiences of unexpected remembering.

To offer recommendations for designing for these spaces, I now consider the creation of a generic database or system for cueing memories. Reminiscing systems in the past have focussed on retrieving physical evidence of memories from the individual to cue remembering but prosthetic memory shows this is not needed. In the next recommendation I explore creating a system based on 'universal' memories: a collection of generic memory cues that can be used to elicit personal reminiscing episodes.

Approach: Universal memories

This approach considers using generic content to cue unexpected remembering. The ability of people to abstract and interpret meaningful information from other people's evidence of memories and reminiscing (prosthetic memories) inspires this recommendation for developing a system of ready-made, universal memories.

In this recommendation I discuss collating 'generic' examples of personal memories and producing a database and systematic store of universal memory triggers that could be presented to people as consequences of certain conditions and situations. I explore these conditions in greater detail in this approach, but they all stem from a system making assumptions on the relevance of a potential memory. Overall, I develop methods for creating and standardising a collection of generic memory cues to trigger real memories.

The benefit of using generic content for its ability to cue personal memories has been considered in research for people with dementia (*Figure 116*). Astell et al. (2010) propose generic items, for example photographs of a beach, might be used to stimulate a person's own memories of visiting a beach and encourage reminiscing of the past as a positive therapy for people with dementia. Using generic images has huge advantages over personal content as there are no right or wrong answers and little pressure to associate generic content with specific memories, correct dates, names and places. Though developed for people with memory loss, the application is relevant to my research when considering how information might be received and the methods that ensure appropriateness and relevance to the audience.

Figure 116: Circa communication support system, uses generic content to encourage remembering for people with Dementia. (Source: www.circaconnect.co.uk)

Supporting the view of the 'self' informing our memories (Markus, 1977), people become experts in what they think they are (for example, shy or sociable), becoming more ready to see social experiences in light of social deficiencies and the way they view the world. This understanding of people as filters to information indicates what might happen when a group of people are presented with the same generic content, like the photograph of the beach. Memories are personal and unique even though they may be experienced with others; people will have different experiences and memories of the same event as the other people there.

These examples suggest value in developing and extending these ideas around databases of universal memory cues, though to understand how designers might approach this, I consider how universal memory cues might be delivered in personally relevant ways.

Delivering universal memory cues

Universal memory cues need to find personal relevance and resonance, and a way this could be done is through matching conditions and filters based on known information. There are examples of universal memories that everyone has such as the first day at school, key birthdays and life stage events, and this could be a starting point in creating a database of generic memory cues. Consider a music playlist of top tens from graduation year at college, or photos from campsites in France around the time of frequent family holidays there. Finding ways of presenting these potential memory cues may produce additional and welcomed moments of unexpected remembering.

Exploring ideas around universal memories and how they might be deduced from basic information known about a person, information could be derived from publically available data stores (for example, home address and occupation) with the system designed to filter and present this information as personally relevant memory cues. Basic understanding around where people grew up, the schools and universities attended and when is readily available and relevant to the universal categories of memories people have: a college graduation, a childhood home or a significant newsworthy event.

Similar to how marketers collect consumer demographics, their methods show value in creating schemas, rules and scripts to understand a person's behaviour and predict situations. The marketing profession has developed standard classifications, personas and customer profiling that provide inspiration and guidance for this approach. Companies use these methods to understand people and predict future trends; *Mosaic*

(Experian, 2009), *Gallup Poll* (2012), *nVision* (Future Foundation, 2012) and *Trendwatching* (2004) all provide clues as to how design interventions can make predictions about a person's memories based on their profile. To recommend support through universal memories it is important to consider how information is presented as this could be the difference between presenting a photo as 'belonging' amongst other genuinely owned photographs inferring ownership, compared to the same photo presented as a screensaver where less is suggested. Combining aspects of prosthetic memory and generic memory cues, information may be made personally meaningful by applying methods used by advertising campaigns that introduce familiarity in the product or service, creating a sense of the known and a feeling of shared experience. Advertising uses a personalised language (Palmer, 2003) to establish familiarity and design interventions could do similar when delivering cues around ready-made memories.

Today's media is targeted towards customisation and "aspires to represent only the individual user's interests" (Palmer, 2003) by speaking to an imaginary individual, ultimately us, the audience. By suggesting shared understanding and knowledge, people find comfort and are more receptive to alien information presented to them. The type of information presented is also an important consideration in determining the success of this approach with higher-level general information, that is less detailed and more abstract, being more suited than detailed accounts of personal experiences. Higher-level information and general assumptions about a person allow for greater abstraction and interpretation and have less opportunity for making (or the appearance of making) wrong decisions about someone's memories.

Personalising the mass-produced

The success of *universal memory* proposals lie in the presentation of personally crafted interactions, even though they come from databases containing prosthetic and impersonal information. Way to achieve this may be found in the way people attribute personal value to mass-produced objects where people welcome crafting unique, personal aesthetic identity onto mass-produced objects (Pine & Gilmore, 1999). Consequentially, manufacturers and designers have changed the way they design products and services to allow consumers more opportunity to adapt and personalise to suit individual needs and aspirations. Designers embracing customer personalisation in mass-produced products include Tristan Webber for Digital Couture BodyMetrics (*Figure 117*) and Ben Wilson (*Figure 118*) to name a few.

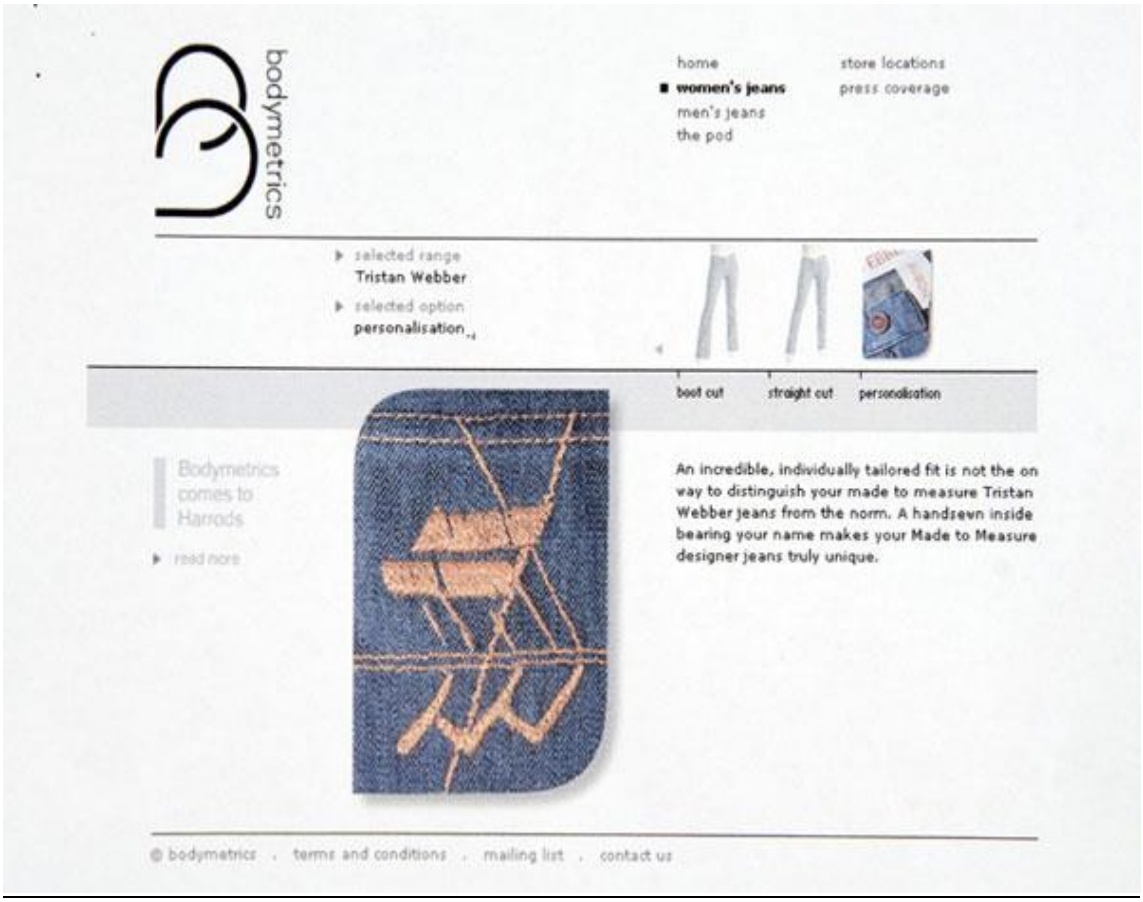

Figure 117: Digital Couture for Bodymetrics, by Tristan Webber, offers a fully made-to-measure retail service: full body scan and personalized jeans made based on individual body measurements. (Source: BodyMetrics, 2012; Webber, c.2005)

Figure 118: Scooterkit, by Ben Wilson, encourages consumers to design, customize and personalize their own scooters from an off-the-peg kit of parts (Wilson, 2008).

Large companies recognising product personalisation as a customer desire and requirement (Palmer, 2003) build personalisation capabilities into the design of products. *Philips* used the term "deep-customisation" (Marzano & Aarts, 2003) to develop 'Open Tools' that allow them to "evolve with their owner, shaping themselves to their specific and particular habits and needs", like the Pronto remote control allowing users to freely create and customise their interface.

Television channels and recording devices also support personal preference, where customisation has changed the way people use TV. Through creating viewing listings and easier recording options the restrictions of TV schedules have gone where (through use) these services learn about the individual and make assumptions from user behaviour and preference. The result are matched services 'pushed' to people to suggest possible 'likes', for example, Amazon stating that 'people who bought this also bought…'. As personalisation tools become ubiquitous, most products and services now offer some form of personalisation; from greetings cards ordered online to TV on demand.

An approach for design

I explore ideas around universal memories in my design proposals (*Figures 119-122*), where the themes of experiencing similar life events and the potential of using 'generic' cues to trigger the memories of these experiences are explored. The first proposal, **Life event radio** (*Figure 119*), generates music stations based on the owner's life events. Music frequently relates to life events and the radio offers an interface for exploring this: tuning in to stages of the listener's life through making connections with playlists tagged by other people as era or life event specific. Understanding of a person having reached a life stage might need to be sourced to ensure music relevance, otherwise the system might make assumptions from knowing a person's date of birth. With less known about the listener, the system could take clues from people generally reaching certain life events at a particular age; if a person finishes school at 16 or 18, they are likely to have memories associated with chart music at that time.

The radio could offer other music stations for specific events, for example weddings, with playlist selections determined by popular wedding music choices. Matching this with many people marrying in their 20's could determine the era is chosen in relation to their date of birth. The music station may offer comforting nostalgia like listening to some mainstream radio programmes, or unexpected long-forgotten discoveries when re-tuning the radio past the 'revising for high-school exams' era.

Figure 119: Life event radio

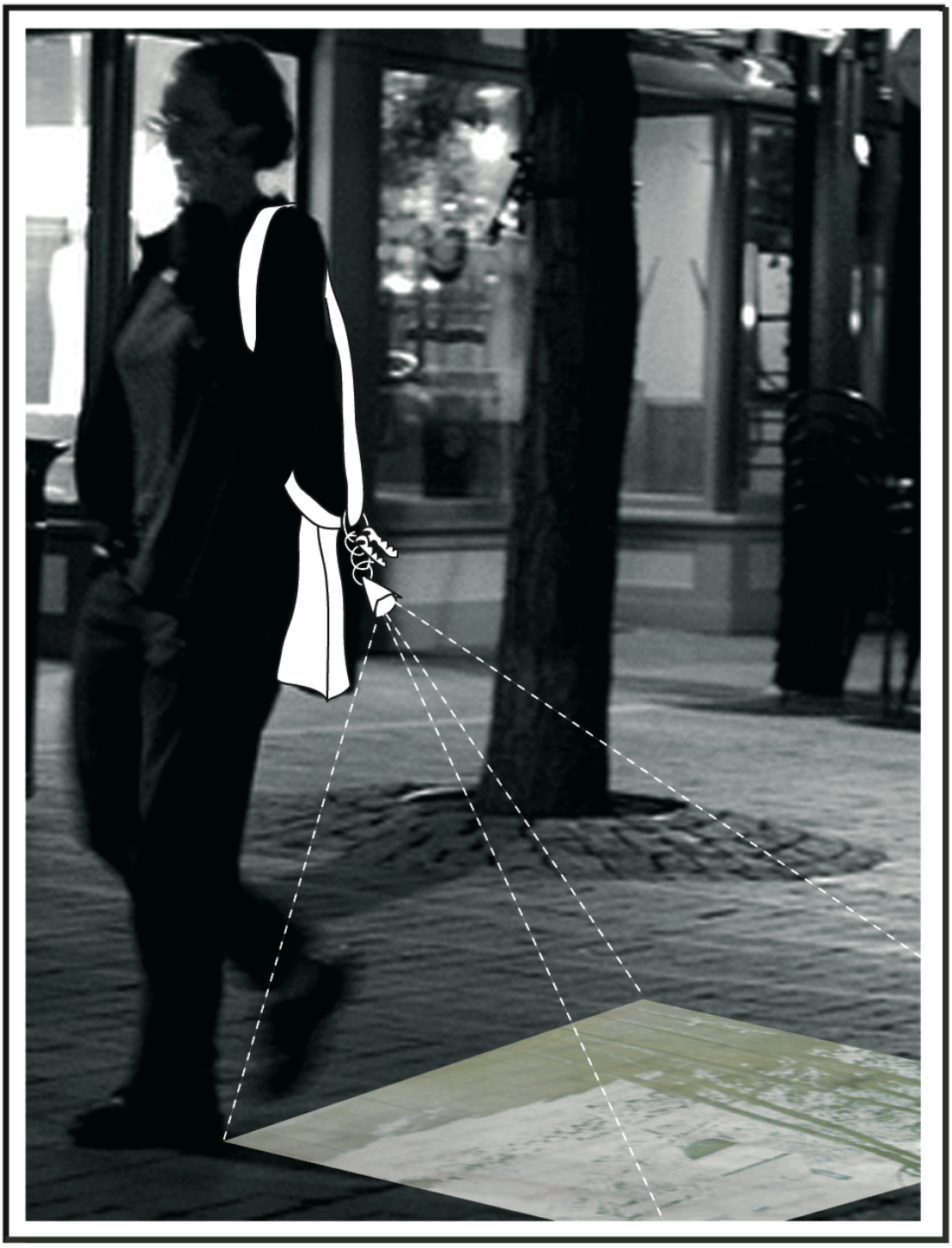

Figure 120: Souvenir key ring

Figure 121: Calendar memories

Figure 122: Topic trivia

BBC R&D (2013) has explored how networked objects, including radios, could deliver

tailored media experiences sympathetic to the environment. Though their *Perceptive Radio* offers support based purely on environmental conditions, such as a phone ringing interrupting listening or changing when someone walks out of the room, and the Life event radio tailors music based on knowledge of having achieved (and when) life events, they both show how experiences can be tailored to meet current needs by collecting additional data feeds.

The **Souvenir keyring** (*Figure 120*) proposal generates a 'personal' photo album of memorable places by collecting other people's online photos of the same locations. Visited places are recorded by the key ring with each location generating an image search for photos other people often take there, and automatically create a souvenir photo album for future access. To ensure the photo collection has relevance to reminiscing, photos of places frequented often may lose significance and re-capture over the less familiar as the system develops understanding about the wearer. This may also influence accessing photos in the future and could be done through purposefully accessing the album in more unexpected ways.

Wearers might be offered reminders to their past through glimpses to photos projected into the environment, similar to Wallace's project (Wallace & Press, 2004). Specific locations encourage people to create 'universal' memory cues which could be used by others for their own personal remembering, for example, the obligatory photo of the Eiffel tower when visiting Paris. How and where these cues are collected and delivered can be explored through many different design iterations; these could have relevance to current location or store for unexpected future memory prompts. Collecting other people's evidence of visiting places we've been offer many opportunities to exploit in cuing our own associated memories.

The next proposal, **Calendar memories** (*Figure 121*), uses a digital display to show 'generic' images of events related to calendar entries. People often cue personal memories when seeing generic images, like a photograph of a beach or the view from the top of a mountain, where they make personal associations and references to them. These are a form of universal memory that is developed further through this concept.

The entries made on the calendar form the prompt for the system to generate the image. Having a near future event might cue the display of associated generic images and potentially trigger remembering when passing by, or the system could make more random offerings by looking to past events. An entry from the previous year may cue related images, triggering serendipitous remembering of the past. There are many ways of developing such a system to support unexpected remembering and open up ways to

explore our past.

The final proposal, **Topic trivia** (*Figure 122*), presents people with information that they might interpret and react upon based on their past experiences and memories. The concept fleetingly suggests cues to topics to muse over when people are most reflective, when embarking on travel. Topic trivia is a small display located at eye level on inside of the front door. Intended to influence a person's thoughts on their way out of the house, the device appears to randomly display a few words to spur on reflection.

Travelling, whether by car, walking or on the train, people's minds are more receptive to reflection and imagining, and often experience moments of involuntary remembering. Presenting topics at the start of this phase may influence this and encourage increased unexpected remembering, where the Topic Trivia display does not necessarily enforce reflection, but offers chance to explore these suggested spaces.

The proposals open up space to imagine and explore the value of designing around universal memories. These ideas, and the abundance of personalisation services that already exist, show support for people's willingness, ability and demands to generate personal understanding and meaning from generic systems. This supports the recommendation for generic memory cues, demonstrating how people receive 'mass-produced' and generic information but take personal meaning and resonance from it.

Approach: Power of imagination

The final approach harnesses people's ability to imagine and interpret impersonal information in relation to their own personal memories. So far in this chapter I have recommended designing support for unexpected remembering by considering personal memories and the evidence around them as a *resource* that can be used and exchanged based on its remembering value to other people, leading to recommendations of delivering *prosthetic memories* and creating databases of *universal memory cues*. In this final recommendation I suggest attributes impersonal content should have in order to encourage unexpected remembering. The level of abstraction of the information needed to trigger unexpected remembering needs to be understood, where harnessing people's imagination is a powerful tool in this approach.

With just a hint, clue or partial visual, people are able to imagine great things, where presenting information that is abstract and vague encourages people to add meaning and

personalisation. To understand how this happens and the methods designers might adopt to develop this, I look at how people create meaning from abstracted information and the benefits in applying under-representation, openness and uncertainty in the design of new memory support systems.

Abstract interpretation

Abstract information can offer different levels of access. At its most abstract, people may feel uneasy about interpreting the information offered, but presented in the right context and in situations that encourage exploration such information can serve as prompts to personal experiences and memories. When presented with abstract information, people can form understanding by relating it back to past experiences and knowledge.

Though used for different means, *Rorschach* and *Thematic Apperception* psychological tests use abstract images to encourage people to interpret and create stories. Although their goal is to understand deeper meaning about a person's personality and behaviour, they are a good example of people exploring, when they have inclination or reason, their own thoughts and memories through impersonal and abstract information.

These tests draw parallels with psychology studies on imagination inflation (Mazzoni & Memon, 2003; Goff & Roediger, 1998; Garry et al., 1996) where people are led to believe they have a memory by being told in conversation or through the objects and images presented to them. When people 'feel' something belongs, they begin the process of imagining the past, how they acquired it and the history behind it. As Goff and Roediger (1998) discuss, imagining performance of an action can cause its recollection as actually having been carried out, creating accounts of false memories. The subtlety for design is encouraging people to imagine and explore their actual memories, not necessarily introducing false one. There is a balance needed where design interventions need to be introduced delicately, sympathetically and with consideration to a person's actual memories.

Another approach to harnessing imagination is to consider what happens when specific details are omitted. Leaving out information when retelling a memory can cause people to fabricate detail, whether consciously or unconsciously, but what happens when this information is left out of memory cues? This could offer a way of re-purposing memory cues specifically targeted towards an individual into generic memory cues about general experiences. Making personal information impersonal by omitting detail could make information more accessible and useful as generic prompts to memory.

Creating memory prompts through abstraction and hiding information encourages exploration of when details are important. Broyard (Engel, 2001) discusses this with reference to the retelling of memories, highlighting the omission of detail when recounting past events as being cognitively efficient or economical. Leaving detail out can make memory more proficient, but the lack of detail may cause people to fabricate information that is false.

Relating the benefits of detail omission specifically to system design, the term 'Under-determination' (Poster, 1999) describes the use of lack of detail in information as a characteristic of new media. Palmer (2003) describes this as "the very lack of determining subject position in the new symbolic media of computerised information, as opposed, in his mind, to the standardised forms of print and broadcast media" (p.1). New media supports lack of detail as it enables devices and interfaces to become an extension of the self, offering full user control (Turkle, 2005; Manovich, 2001). Potential memory cues could present similarly through offering just a hint as people use life experiences to embellish meaning. Under-representing information to guide exploration of a topic could encourage design proposals that present common themes associated with involuntary memory, such as long-forgotten childhood memories by presenting images of a child playing.

Leong et al. (2010) explore features of under-determination in studies presenting other people's photographs when listening to music. Though the aim of their study was to record coincidences between photographs and music influencing a person's mood, seeing the photograph in some instances, promoted reflection on the person's own memories.

Benefits of under-representation

Information is pushed to people daily through media channels, presented in ways that invite personal interpretation and association. Examples of this can be seen with ambiguous information found in psychic readings and horoscopes that encourage people to make personal connections with intentionally impersonal information.

Conceptual artist On Kawara offers similar reflective spaces with his *Date Paintings* (Watkins & Denizot, 2002) by presenting information from the media to invite speculation from the audience (*Figure 123*). Using media coverage from significant dates as evidence,

Figure 123: Date Paintings, by On Kawara, juxtapose a local newspaper article with a painted typographical record of the date. Kawara has produced a date painting every day since 1965, from various cities from his travels. Each painting's date is a true representation of the date format used in the city he is visiting. (Source: visual-poetry.tumblr.com)

interpretation is left to the individual with personal reflection and memories of that date playing an important part in understanding and appreciation. Designing for the potential of people's imagination, Brown and Duguid (1996) make the argument for under-representation.

> The future of design in information technologies lies not in developing means of increasingly full re-presentation, but rather in allowing increasing amounts to be underrepresented; not by increasing what is said, but rather by helping people to leave more unsaid; not in refining abstractions, but rather by making use of their inevitable impurity; not by making more explicit, but rather, by leaving as much as possible implicit, and in the process keeping things simple. (Brown and Duguid, 1996, p.1)

In the design world, much has been documented around the information products and devices provide users with. People give meaning to information presented, with the level of detail determining the level of interpretation. McCarthy and Wright (2007) discuss value in presenting relationships with technology that is, to a controlled extent, open and

unfinished to users, encouraging the process of sense making. Embracing open-endedness encourages creativity (McCarthy & Wright, 2007), where given something 'unintelligent', abstract or unusual, and presented with little information, people interpret it to a greater extent.

Gaver et al. (2003) explore aspects of open-endedness and under-representation with reference to ambiguity and its offerings to design. They approach ambiguity as an opportunity to explore and appropriate personal meaning to a system as it allows for multiple meanings and interpretation, ensuring designs do not constrain users into specific responses. This is highly relevant to the design of memory support systems as memories are unique and embedded in personal interpretation; a system would fail to offer support if too exacting and prescriptive.

Similar themes are discussed by Sengers & Gaver (2006) with regard to leaving systems open to interpretation, identifying systems that offer multiple interpretations and understanding can co-exist and offer advantages to all. They propose that the design and evaluation of a system focus on multiple interpretations as it can identify and open up new meanings and responses rather than directing use through presumed, specific and desirable outcomes; limiting the potential of the system. Applying this strategy to unexpected remembering offers people freedom to select their own reference points from what is offered, encouraging engagement and drawing meaning from the information available.

The work of Natalie Jeremijenko (2000) puts the attributes of under-representation and the power of people's imagination into practice. Her 'Voice Boxes' art installation consisted of hundreds of small boxes that did 2 things: recorded sound when opened and played the recorded sound when picked up (*Figure 124*).

During the installation she found people did inventive things with this simple interaction. People would give the boxes personalities and behaviours, saying things like "Put me down!" or they threw their voices or left comments all over the gallery on other art pieces. Jeremijenko commented that "people do smart things with dumb objects, and dumb things with smart objects", and the result of the installation was "not only an illusion of 3-D sound, but actually a commentary and even, occasionally, wit".

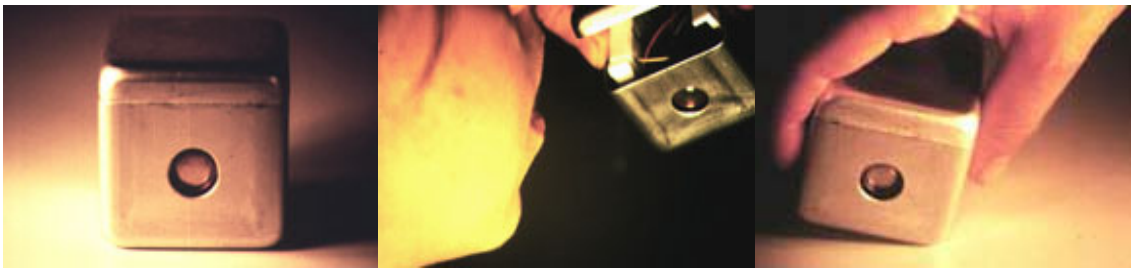

Figure 124: Voice Boxes, by Natalie Jeremijenko, are a series of small boxes that allow people to record short messages which play back when picked up, moved, thrown or dropped. Presented in groups, they provide visitors the opportunity to anonymously record, listen in and leave messages for other visitors. Source: http://tech90s.walkerart.org

An approach for design

The harnessing of people's imagination to encourage reflection on past experiences and memories are explored through my design proposals (*Figures 125-128*). The proposals are informed by the themes discussed and present ideas to inspire enhancing reminiscence support.

The first proposal, **Imagination filters** (*Figure 125*) applies a filter overlay to a 'known' photograph, changing its appearance to offer a new perspectives and further investigation. These obscured images appear randomly on mobile device screens, where they don't necessarily require people to act upon seeing them, but may cue remembering.

The content may come from the vast photo collections people store digitally, or relevant content not personally owned (friends 'public' photos, location-relevant photos), where offering distorted views and new perspectives encourages new access. The filters range from pinhole cameras and frosted glass views offering small peep-holes to the image, to extreme close-ups of detail or fuzziness that become clearer over time. With any of these there are different levels of interaction. Recognition through minute detail or a blurred composition may immediately trigger spontaneous reminiscing or unconsciously set-up remembering for the near future. People may also choose to interact directly with the image, clearing the filter and accessing the entire image for deeper understanding, otherwise it might simply go unnoticed and have little impact at all.

The **Bus shelter window** proposal (*Figure 126*) uses a camera to create a video feed to a display in the bus shelter, where having the camera elevated high above offers a new perspective. The window offers two camera views: the current live feed displayed against a delayed feed from the past. The delayed view randomly changes from day to day; some days it will be yesterdays capture, other times last years, but seeing this alongside current capture offers space to reflect and imagine.

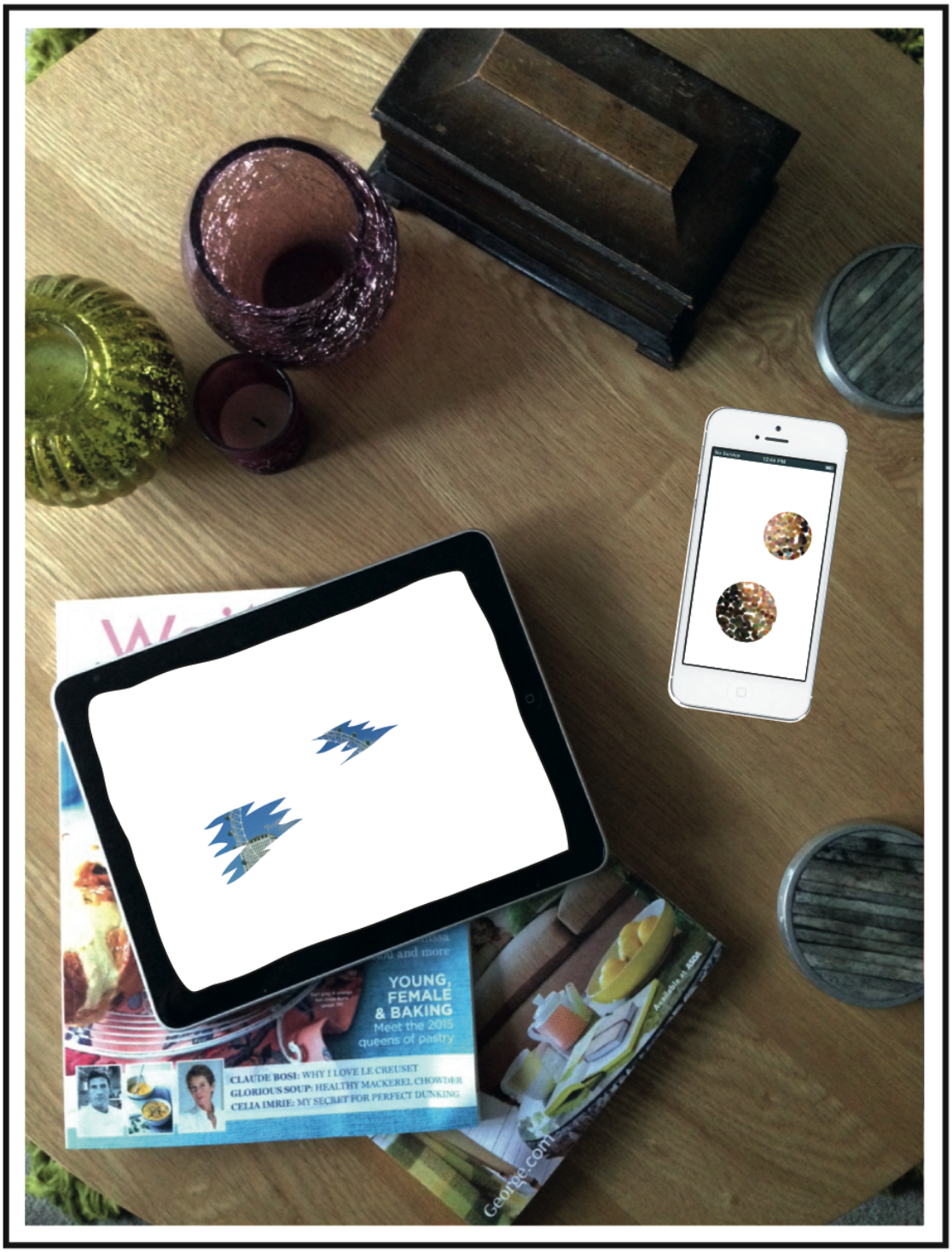

Figure 125: Imagination filters

Figure 126: Bus shelter window

Figure 127: Play park boxes

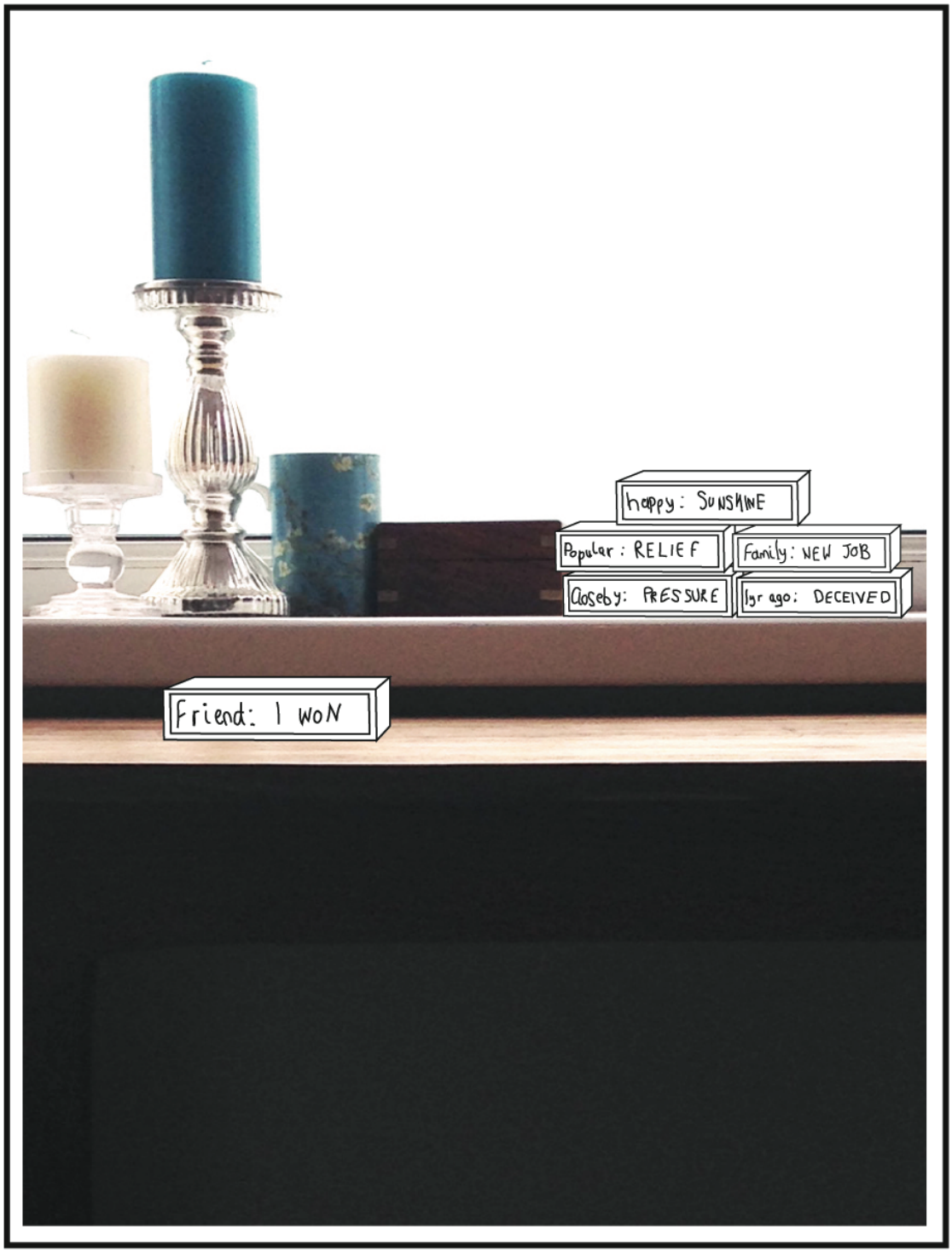

Figure 128: Word generator

Comparisons of differences and changes between the two images might be made alongside further reflection and reminiscing around what people were doing at the time. Were they waiting there last year too, where the delayed feed might offer glimpses to their past, either visually or through their imagination. The bus shelter offers an ideal space for such a device as the nature of being there and waiting encourages reflection. Providing prompts may spur on unexpected remembering where, in this example, the unknown delay of the feed offers different levels of engagement with each visit.

Located in a children's playground, the **Play park boxes** concept (*Figure 127*) contain deconstructed elements of children's nursery rhymes and stories for children to discover. Each box contains related images, sounds or smells designed to encourage children to imagine and remember; triggering memories of the story, or other personal memories cued by the contents of each box. The age-appropriateness of the box's content could be determined by adjusting the height of the box. On weighted pulleys, bringing the box closer to the ground fills the box with toddler-related content; in contrast, lifting the box up high provides content more appropriate for older children and adults.

Boxes currently containing links to Hansel and Gretel might show images of candy canes and dolly mixture sweets, alongside the smell of gingerbread and the sound of a crackling fire. Children might make a direct link to the story from interacting with all boxes, or may remember other memories: making gingerbread at Christmas or eating sweets at the cinema last week. Designed for children to explore their memories, these boxes make links and create connections, but also offer new spaces to imagine and influence current play.

The final proposal, **Word generator** (*Figure 128*) consists of a collection of boxes, each offering pre-defined one-word search options to your acquaintances online account activity. Using a keyword to generate searches, the boxes display random matches from a friend's status, providing new spaces to imagine and reflect upon past experiences and understanding, and moments for forming new associations.

Other applications for these boxes might see a separate box for each acquaintance, with updates whittled down to a single-word display of recent online presence. Providing a window into the general activity or mood of a group of people could encourage reflection on current activity through vague references and past understanding.

These boxes might provide reassurance that your community is content, or concern over an unexpected clue that needs further investigation. They might also offer occasional and unexpected prompts to the past when words resonate personally and the box becoming momentarily disassociated with the creator. Words, whether associated directly

with their source or taken out of context, can often offer hints and cues to memories, and these boxes begin to explore ways of collecting and presenting words to encourage imagining around their source and current display, offering spaces to explore and make connections.

Evident in these proposals and discussed in the themes earlier, there is value and potential for personal reminiscence when presenting information that allows people to imagine and speculate, encouraging them to draw their own conclusions on meaning and understanding. The benefits of harnessing people's imagination to interpret and develop their own understanding around a system's offerings is clear when considering the main research challenge for how might a system present triggers to personal memories when at the same time, attempting to support unexpected remembering. Developing strategies for designed supported that builds on people's ability to imagine and interpret content not personally owned offers a compelling approach. Harnessing people's imagination to support unexpected remembering gives designers opportunity to introduce spaces to explore that are more universally accessible, rather than limited and prescriptive in attempting to match people to specific individual memories.

Conclusion

Along with understanding gained on the subject of involuntary memory and current support for personal memories, through this chapter I have shown how unexpected remembering might be triggered, supported and extended beyond current means. My aim has been to offer final recommendations for how design might support moments of unexpected remembering and through each, suggest themes to explore and develop alongside new design proposals.

Approach: Evidence of memories as resource

My first approach introduces the overarching theme for the recommendations: understanding personal memories and the evidence collected around them, as valuable to other people and their memories. People's memories can be valued at different levels and for different means; hearing other people's memory information may trigger our own memories, whilst stored data about us can be used to cue other people's memories.

Treating the evidence of people's memories as a resource offers insight for how this type of information can be appreciated beyond current memory support (as discussed in *Chapter 2*) and provides background understanding to my subsequent recommendations of supporting *prosthetic memories, universal memories* and *harnessing imagination*.

Approach: Prosthetic memory

The recommendation *prosthetic memory* proposes information that is impersonal and belongs to others is able to spur our own memories through how it is presented. I have used examples from media to demonstrate how people are responsive to hearing and seeing other people's evidence of memories, and have an ability to reflect and respond through personal experience.

This approach clearly supports remembering personal memories unexpectedly, and suggests it is the situations around prosthetic memory that designers should look towards for inspiration for new service offerings.

Approach: Universal memories

My next approach, *universal memories*, considers the creation of databases of generic memory cues. This approach builds on the 'universal' memories everyone experiences, memories often created from reaching life stages.

Through applying tactics, such as schema theory, to make assumptions on the memories people have, basic knowledge and understanding gained about a person might inform a system of the memories they are likely to have, and the types of cues that might trigger their associated memories.

Approach: Power of imagination

My final recommendation, the *power of imagination*, demonstrates the benefits of using abstract and impersonal information as memory cues. If presented sympathetically, this type of information has the ability to trigger personal memories through harnessing people's imagination.

People are able to imagine and interpret meaningful and personal understanding from information that is neither created by, nor intended for them, relating what they see or hear to their own personal memories, given the right conditions. This shows how treating information in certain ways (abstracting, hinting, speculating and leaving open for interpretation) creates spaces for personal reflection.

These recommendations show how the valuable but very challenging aspect of memory, involuntary memory, can be supported and enhanced through design. My design proposals illustrate ways to explore aspects of unexpected remembering and offer spaces for people to imagine and re-create their past. Overall, this chapter recommends creative approaches for dealing with involuntary memory and new ways of designing for personal memories as a result. I discuss these in greater detail in relation to the research as a whole, in the next section as final conclusions to the research.

CHAPTER 6

Final conclusions

Overview of design recommendations

This investigation has explored how unexpected and involuntary remembering can offer a new distinctive approach to designing support for personal memories. To accomplish this, I have interrogated current approaches and theories in a range of related disciplines, alongside conducting my own studies and practical explorations to discover the emerging themes.

I have explored personal remembering by reflecting broadly and extensively around the subject of involuntary memory where the subject area is, by its very nature, vast. As such, I have referenced practitioners from a variety of disciplines; research from psychologists on how people build, keep and visit memories; the role of objects as memory triggers from material cultures scholars; and musings on the value of involuntary memory from philosophers. Not only do these offer general concepts around personal memories, but pockets of deeper understanding into the influences and nuances of unexpected remembering. This multi-disciplined approach to scoping the research highlighted early on how involuntary memory, still an emerging strand of psychology research, holds immense relevance and importance to designers of memory support systems.

Even in most recent publications, designing for involuntary remembering is seldom considered despite its frequency in daily life. Predominantly, focused design support still resides in assisting elements of voluntary remembering for capture, maintenance and recollection through memory evidence. Encouraging people to engage with devices and systems to aid future access to memories requires dedication from users.

Whilst there is still great value in collecting and displaying physical evidence of memories, and memories are often triggered from their display in the home, this aspect of autobiographical remembering has and continues to be successfully supported by design. There is however, this other aspect to remembering which has been overlooked and unsupported. By conducting this research, I have discovered that there are easier, and often more sympathetic ways for people to trigger memories by considering designing specifically for our involuntary memories.

New approaches to remembering

Overall, this investigation documents a broad exploration and reflection upon unexpected remembering, and throughout I have been guided by the following questions:

1. Can understanding around how people collect, store, maintain and recall memories show that involuntary remembering plays a key role in personal remembering?
2. Can successful support for autobiographical remembering be encouraged through designing new unexpected and involuntary experiences for our personal memories?
3. Is such support important and valuable to people's desires for remembering and reminiscing?
4. How might designers use this research to support people's autobiographical memories in the future?

These questions formed the approach and structure to this document: identifying the issues with current support, the challenges researching the subject of involuntary memory, and the value in finding solutions to support unexpected remembering. Overall, the questions I asked and the methods I employed highlight ***new ways of understanding and supporting personal remembering***.

My research adopted a variety of methods to further understanding around involuntary memory, where each approach influenced the requirements of scholarly research and practice work. To define the requirements of support, I drew heavily on psychology discussions and research on how people remember. This process enabled analysis and comparisons of current memory support systems, judging best practice for supporting personal remembering alongside how people wish to engage in reminiscing. This activity highlighted inconsistencies with how people *naturally* reminisce and how current systems *support* reminiscence.

Issues with current support

Interrogating psychology research on the nature of memory, I identified current support as being designed in conflict with how people naturally remember. This process allowed reflection upon the aspects of human memory current systems fail to support, for example, the benefits of forgetting, the unexpected encounters with memory triggers met by chance (though some research by Leong, 2009, has begun to address this), a person's inability to remember everything, and the adaptive nature of memory where the context of retelling influences how the memory is remembered again in the future. My research proposes

memory support systems address some of these characteristics to be able to offer *valued support* for our memories.

I consider this *value* in terms of the strong emotional feelings and welcomed pleasure triggering memories can bring. Memory support systems relying on explicit accounts of remembering, with people having to go to the system to purposefully engage in reminiscing, take some of the value of remembering away. This form of voluntary remembering, the basis of current support, misses the added emotional value re-discovering forgotten memories unexpectedly can bring: the importance of involuntary memory to personal reminiscing. Also, systems that rely on voluntary access favour personal content uploaded and maintained by the individual, where this content is in addition to the databases of information people already contribute to daily.

Where recent work by other researchers has begun to explore elements of unexpectedness, randomness and serendipity in the design of memory support, their designs still base interaction around users inputting and accessing their own personal content and deciding on the form their 'random' encounters with it will take in the future. These examples require considered interaction from users to either input (Hsieh et al., 2010) or receive personal content (Leong et al., 2011; Peesapati et al., 2011). My research offers compelling evidence that creating and maintaining databases of personal information for potential reminiscing in the future is no longer needed. Support for autobiographical memory no longer resides with the individual and interactions with their personal cosmos of data, but extends beyond, where other people's data has huge and sometimes greater impact on our own memories.

In addition to the actual memory trigger being significant to unexpected remembering, how it is encountered is also important. The quality of the experience and the euphoric feeling of re-discovering long-forgotten memories, a main characteristic of involuntary remembering, was evident in many examples collected in the practice work.

By reflecting upon the key elements missing from current support, I orchestrated my design explorations and proposals to test developing theories and recommendations: how, when and why do involuntary memories occur and which have the strongest emotional impact? This method discovered examples that led to further investigations to understand the specific characteristics of these memories, before reflecting upon them to create later design proposals and final recommendations.

Challenges of the subject

The characteristics of the subject matter bought many challenges, none more so than how to extract examples of involuntary memories that by their very nature are spontaneous, fleeting and appear unexpectedly. The originality of researching this subject through design ensured no precedents had been set so new approaches had to be taken to explore the subject and extract the information needed to test my emerging theories. These approaches formed part of a developing reflective process, and as such, some design explorations are on the edge of the subject but were conducted to illustrate relevant aspects of personal remembering.

The practice side provided evidence and the backbone to the emerging theories. Gathering the anecdotal evidence of unexpected personal memories had been important throughout, and early on the challenges of extracting this information because of its elusive, and at times, intangible nature, proved daunting and troublesome. Finding successful methods to do so proved key to illustrating the value and importance unexpected remembering has in everyone's life and contributed to a generative design process that was productive in driving my design thinking towards uncovering this exciting little-explored space.

I dedicated chapter 4 to exploring these methods and it is testament to its importance on shaping and contextualising the value and originality of the research. People's reflections of their involuntary remembering show the emotional value and importance of this type of remembering, and help define the spaces for design recommendations presented in chapter 5. They support theories from psychology literature reviews presented earlier in the research and help illustrate the conflicts with how current memory support systems only address voluntary memory and fail to account for the involuntary memories that feature so heavily in daily life.

Undiscovered value in designing for involuntary remembering

Above all, my investigation offers support and evidence for the main finding, that there is *undiscovered value in designing for involuntary remembering*. The design explorations and scholarly research I present identify previously un-tapped design wealth around involuntary memory, where exploring the subject and considering the contexts and situations in which such remembering occurs, present many new opportunities for designers. The situations contributing to unexpected remembering, whilst occurring unexpectedly and randomly and therefore difficult to predict and design for, create

reminiscing so emotionally powerful that finding ways to orchestrate more situations would be welcomed by people. I present design proposals throughout this document that identify situations where design might intervene to encourage spontaneous, unexpected remembering. Though these situations may not always cue involuntary remembering from people in the vicinity[15], designing situations to present memory triggers offers potential.

The design recommendations and approaches presented in chapter 5 contextualise and define the key findings of this research, and identify the new contributions to the field. To summarise, these are:

The value of context

Scrutinising where, how and why involuntary memory episodes occur identify new spaces to consider for designing support for remembering. Where many memory-support systems for voluntary remembering have been located in the domestic environment, my explorations show that much unexpected reminiscing occurs whilst away from home and these different environments afford different support.

Many involuntary memories experienced daily occur whilst moving through transient spaces, going from one place to the next and unexpectedly meeting memory triggers in the environment. As a result, future designed support might consider mobile applications otherwise take the characteristics of transient spaces as design inspiration. These contexts are rarely considered in the design of personal reminiscing experiences with past support favouring fixed devices in domestic spaces, so offer new unexplored opportunities for designers.

The value of inaccessibility

In the past, being unable to access memory information was considered a failure; instead inaccessibility can be seen as a characteristic of involuntary memory. It is the long-forgotten memories, being remembered unexpectedly that form the most intense and powerful reminiscing episodes, where if a system proved too successful in triggering long-forgotten memories, they may prompt so many memories that none remain a surprise to us. A system supporting unexpected remembering must work successfully but occasionally, and not too often, to keep the qualities and value of involuntary remembering.

[15] As delicacy and subtlety is needed in presenting memory triggers so people feel they are met by chance rather than forced and prescribed, a result of getting this balance right might result in directed instances not being recognised.

Systems supporting the life-logging and capture of every moment of a person's life, challenge memory's ability to forget. These systems harness technology's ability to store everything to alleviate forgetting, but this brings its own problems as vast databases of personal content reside hidden on storage facilities, often never accessed. However, this un-accessed content offers opportunities for designers, some of whom have already begun exploring ways to rediscover personal content for reminiscing (Banks, 2011; Peesapati et al., 2011; Hsieh et al., 2010; Leong et al., 2010; Leong, 2009) and other examples proposed throughout the latter chapters of this document. These databases of personal content offer opportunities to other people too, for whom the content does not belong; impersonal content is a strong characteristic in unexpectedly triggering our memories.

The value of impersonal

People cue more episodes of involuntary remembering from memory triggers that are neither created nor owned by them, but are met in the environment by chance. This was evident whilst collecting anecdotal evidence of involuntary memories (Chapter 4) where the stronger examples collected during the day were triggered by objects, and occasionally smells, met unexpectedly and randomly whilst moving through environments.

The benefits of this finding is two-fold: people's collecting of personal memory triggers do not need to become the focus of designed memory support (as has been in the past) and, existing databases of impersonal content (of which there are many freely available) have the power to trigger strong emotional unexpected remembering. People's ability to make sense of impersonal information comes from their power to imagine and reflect based on their own personal experiences and understanding. This power of imagination and its relevance to unexpected remembering is discussed in the next finding.

The value of imagination

People do not need explicit reference to the content of their memories to trigger them. People are able to make sense and fill in the missing gaps to fully explore past memories when only hints are needed to trigger a chain of subsequent reminiscing. The benefit of only needing hints towards memories aids designers as explicit replicas of memory triggers are not needed, complimenting the use of *impersonal content* previously discussed. Together, they offer designers many more opportunities and situations for encouraging unexpected remembering.

As hints exude little information, this finding shows explicit explanation is not always needed to trigger deep accounts of personal remembering[16] and potential triggers do not need to be directed expressly towards the individual; having to do this would present memory triggers explicitly and forcefully, and not as the random, unexpected meeting of triggers involuntary remembering characterizes. Current memory support systems generally rely on explicit triggers to memories, aimed solely at the individual. My investigation shows this is not necessary as providing hints to triggers and using the power of people's imagination can trigger powerful remembering.

The value of design proposals

Illustrating emerging themes as design proposals has been valuable to my research. I found the proposals offered great opportunity for exploring new design spaces as their lack of specific detail (aesthetic, use and functions) encouraged extended imagining and exploration around the ideas presented. If details had been too finalised, their application would be fixed and limited with critique forming purely around their interaction capabilities and physical attributes. My intention was to offer design spaces to imagine and explore ideas around new emerging themes, which the openness of narrative proposals (Gaver & Martin, 2000) affords[17].

Design proposals have been extremely beneficial and successful in mapping out this new design space, marking out potential landmark themes for designers to revisit and develop more concrete offerings. By creating on open narrative around the collection of proposals in each theme, as groups, suggest positions in the territory to explore rather than offer definitive solutions.

To end with one or two final products or systems would have constrained the ideas and themes too much into a prescriptive narrative, failing to open up this new design space in a way that would encourage and inspire designers to explore and support unexpected remembering. Accompanying final recommendations with design proposals intended for further exploration and interpretation presents the research as it was intended, as an offering for designers to use and develop further. I have compiled the collection of

[16] The characteristics of triggers to involuntary memories are shown in the explorations in Chapter 4.

[17] Although I did build prototypes during design explorations to discover more around emerging themes and these, I use these in a similar way to design proposals: to speculate and reflect upon the possibility of such systems, for example, Chapter 3's Display Rodent. Important was using technology to explore interactions with the attic space and as such, the prototype was created to house the video camera and not for aesthetic appeal. Indeed, constant tinkering and programming of the device to respond to current debate over how the system should perform highlight the prototype as a tool to explore ideas rather than suggest a final solution. The building of Display Rodent offered similar value to that found with my design proposals; they offer spaces to explore ideas and invite debate without promoting finality.

40 design proposals generated from this research, and presented throughout the thesis, as an accompanying workbook of proposals (for pdf version see *Appendix 5*, printed books also available on request).

The process of innovation

Overall, my approach to exploring designed support for involuntary memories offers a source of inspiration for designers. The final recommendations in chapter 5 not only present guidelines and opportunities that exploit the research findings and form a synthesis for future work around remembering, but developing and applying these methods and processes to other domains may also prove valuable and present new opportunities to other subjects. Therefore, this thesis can be seen as a design resource, and discovered, on two levels: as a process for understanding and exploring the *domain* of chance memories (*Figure 129*) and as a process for exploring the *methodological* approach of a reflective design practitioner (*Figure 130*).

A design resource for the domain of supporting memory

The thesis as a whole, and the summarisation of the research in the diagram (*Figure 129*), can be considered a resource as it offers many ideas, areas and suggestions for people interested in designing to support memory. Exploring the diagram offers insight into the domain, identifying relevant literature and key theories, and the considerations needed to offer relevant support.

The resource identifies the move away from current support focussing on collecting, building and maintaining personal evidence of memories, to development of the domain to consider using impersonal materials to support involuntary memories. This is a significant change from current thinking around how designers might support memory and the research offers compelling reasons why support for chance memories would be welcomed and how designers might explore the subject further.

Identifying, exploring and reporting upon the areas of value to chance memories, suggests where designers might focus additional investigation to further the work presented in this thesis. My intention is for this research to act as a catalyst to sparking further debate around how my approach to supporting personal remembering offers many more opportunities for orchestrating valuable and welcomed experiences of personal remembering.

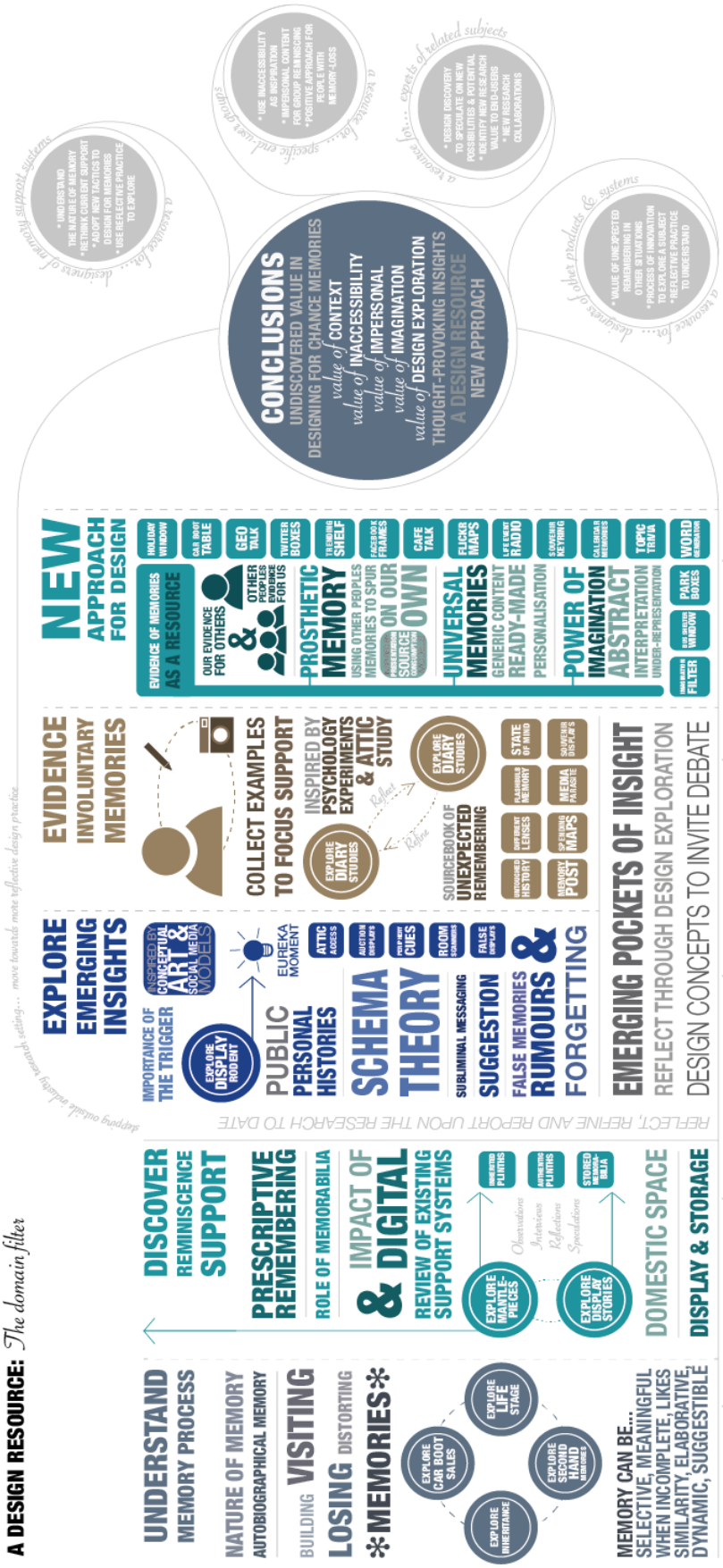

Figure 129: A design resource for the domain of supporting memory (see *Appendix 6i for high resolution version of diagram)*

Figure 130: A design resource for the methodology of research through design (see *Appendix 6ii for high resolution version of diagram)*

Integral to the research has been the development of the findings from literature reviews and empirical encounters through speculative design to not only identify the different approaches designers might consider, but present these as ideas and recommendations that can be used and developed further to continue exploration of the subject, and offer a design resource for supporting chance memories.

A design resource for the methodology of research through design

Throughout this research I have adopted a reflective design approach, grounded in scientific theories and literature, to explore the subject of involuntary memory. The approach and the documenting of the process itself (see *Figure* 130) can be considered a design resource to people carrying out research through design in domains outside of memory support.

My approach to discover and reflect upon understanding gained through design explorations has enabled me to flexibly use different ways to report upon new insights, moving between and balancing of literature reviews, empirical encounters and design speculations. The diagram's (*Figure 130*) linear format represents the (general) timeline of research, progressing through chapters. Early work charts exploration of the subject in literature reviews and reflections on current support, moving towards a turning point in the research at the end of chapter 2 where my supports of an industrial research setting are removed and I move towards individually-led reflective practice. This point aligns with major reflection, filtering and refining of the research, consolidating the substantial initial exploration stage into focussed research directions.

Throughout, I use small empirical encounters to discover more around emerging pockets of insights, with these insights inspiring design proposals that present ideas and current thinking, though their use changes over the course of the project. In the first half they are used to explore ideas emerging from the empirical explorations, loosely linking insights to proposals, with the proposals illustrating the themes and findings. In the latter half of the research the proposals are developed more clearly for their value in evidencing and supporting specific recommendations to invite speculation and debate, and encouraging readers to rethink the potential of designed support for personal memories.

My overall approach interweaves the methods described in the methodology (as seen in Figure 1), depending on the requirements of each research stage, where more focus might be given to literature reviews over empirical studies, or as seen in later chapters, the prominence of design speculations over literature reviews. This is an approach for doing research through design that can be adopted and furthered in other

subjects and identifies the value of reflective design practice in exploring subjects in which designers might not be expert.

Mapping the process of understanding and exploring the research domain shows how each stage, and the design explorations within, can be explored on its own or as part of a larger whole (the thesis) to explore a range of alternatives to current designs for supporting memory. The diagram illustrates how some chapters require focus on literature reviews, presenting insight through thought-provoking design concepts (for example Chapter 2 determining current memory support), whilst others develop through a series of empirical investigations, supported by literature reviews (for example, collecting and presenting examples of unexpected remembering in Chapter 4). The differing methods and tools used in each suggest benefits a flexible approach to understanding and exploring a project can bring; adopting relevant methods as and when needed, and an approach that delivers an innovative process for discovery and development of a subject.

There are a number of key characteristics of this practice that might support other practice-based researchers in extending this work or in exploring other, distinct domains. People looking to adopt a similar approach might consider the value of bringing together the theory and practice work through smaller empirical encounters to drive the research forward by continuously responding to developmental insights. These encounters are helpful in offering space to reflect and respond to literature reviews and emerging themes, and inspiring speculations and recommendations. A characteristic of this approach is the iterative process of responding to current project demands by moving between appropriate methods, as and when needed.

The process of continuously responding to theoretical understanding through explorations in design practice ensures increased opportunity to explore, reflect, and respond to current thinking, enabling learning from experience to move the process on. As a process of innovation, it is valuable to others in suggesting how they might adopt, repeat and further this (and other) subject(s) further to generate new offerings.

The value to end-users

The thesis introduces a new approach for designed support for personal memories. By exploring how people access their memories, I identify a valuable but challenging aspect of memory, involuntary memory, which is currently unsupported but offers an inspirational resource for designers, subject experts and specific groups of end-users. The value of this research to each of these groups of people can be considered on individual merit.

Designers of memory support systems

Memory support systems have been previously designed around pro-active, voluntary retrieval of memory cues where little exploration acknowledged the value of involuntary remembering. My research contributes new knowledge for support by considering unexpected remembering, discovering new insights and identifying new approaches. By reviewing existing practices early in this research, and discussing where inconsistencies lie in offering support that reflects how people naturally remember, the final recommendations contribute new visions to designing personal memory support.

The main research finding, that there is value in using impersonal content to cue personal memories, is a significant step away from current thinking that to engage in reminiscing requires people to purposefully collect, collate, archive and enquire with a system. This has the potential to change the way designers think about offering support and I give compelling evidence to encourage industrial and academic memory research and design groups around the world (for example the Materialising Memories group at University of Technology, Sydney, and the Human Experience and Design group at Microsoft Research, Cambridge) to offer provision for involuntary remembering as it features so heavily in daily life. Such groups could successfully explore chance memories by applying my recommendations (presented in Chapter 5) for designing systems that use impersonal content, consider universal memories and harness the power of people's imagination during interpretation, when exploring potential offerings.

Designed support might present impersonal information, for example, music, TV programme or newspaper article, that is likely to cue personal remembering due to the system identifying potential relevance by making connections to known information such as place and time of college graduation. In doing so, memories may well be triggered unexpectedly, but how might such systems change the way people design for personal memory engagement? Systems offering support for chance memories have different requirements for databases of information (moving from archives of personal data people actively contribute to, to databases of impersonal content that exist as a consequence of other actions, for example, daily contribution to social media websites), and designers may need to reconsider the situations and experiences conducive to reminiscing, to access this information. Existing systems are often designed in domestic settings, as often that is where people manage their digital and physical archives of memory evidence, but with discovered value in using impersonal content for reminiscing, designers may focus provision elsewhere, such as in systems for cars or travel more generally, or in public spaces where people gather, such as coffee shops and waiting rooms.

My research has made significant steps towards exploring this new position in personal memory support by identifying which spaces to explore further, presenting concepts to invite debate and proposing a series of final recommendations to focus future work. These new insights may encourage designers to consider how developing these new approaches can support personal memories better. By identifying the importance of unexpected remembering to personal reminiscing, this research offers new knowledge, possibilities and potential to designers of memory support systems.

Designers of other products and systems

The methodological approach I adopt for carrying out research through design (discussed as a resource for designers in *figure 130*) has value to exploring other domains. As a process, I present universal methods for exploring any subject by showing how reflective design thinking can be helpful for the discovery of new actionable insights in subjects designers are not experts but need knowledge of, to generate new design ideas and proposals.

My process describes how these smaller design explorations (observations, discussions, cultural probes, proposals, quick prototyping) are helpful in opening up a subject laden in scientific theory and experiments, to discover new approaches and recommendations for designing support. A designer might adopt a similar reflective design practice to any subject to extend their knowledge, extract relevant design insight, invite new speculations over possibilities and explore new product and service offerings.

As well as my methodological approach being a resource to people designing in other domains, there is also potential value of chance memories in other domains, where knowledge, insight and recommendations for unexpected memory support has relevance to many moments of daily life. My design thinking and recommendations for exploring the domain might be relevant and utilised by designers of other products and systems.

By understanding situations and conditions conducive to chance memories, and applying elements of the design recommendations and approaches could promote unexpected positive feelings or playful elements that heighten experiences beyond people's expectations, for example, being reminded unexpectedly of the past whilst waiting on a train platform or at a bus stop. Moments of waiting are apt for exploring memories and media advertising designers, for example, could tap into this to present information that encourages us to explore our past whilst still delivering brand experience. Exploring ways to encourage unexpected encounters with our memories may offer

enhanced experiences of using systems when they offer this welcomed, playful and personal resonance that users appreciate and enjoy.

Experts of related subjects

The research shows how adopting a reflective design process can add value, new discovery and contributions to a subject that is inherently established in another discipline, in this case psychology. The process has opened up the subject of involuntary memory to encourage continued exploration by others to offer new support, and as a result, shows how design discovery can be used to speculate on the possibilities of subjects only previously documented through experts in their field. In doing so, the design explorations not only explore end-user value and application, but also extend potential value to others not previously considered.

The value to subject experts seeing their research explored through a design-led discovery and innovation process allows exploration of their subject's relevance to different groups of people (experts of other disciplines, end-users, specific groups of end-users) to see where new collaborations might be made and present new application ideas, proposals and end-user experiences. Indeed, a design-led investigation may discover new perspectives or phenomena for investigation by experts in other domains, for example, psychology. In this way, the value of a subject, such as Big Data for remembering, might be considered as a topic for psychology and not just collaboration.

Throughout my research journey, the design explorations helped identify the new connections between various subjects and personal reminiscing: connections not obvious through visible similarities and relatedness but as a result of design explorations discovering new relevance and value. I discovered the value of Big Data, for example, which is often newsworthy for its negative impact on people, but can also be valuable to unexpected remembering and have positive benefits if re-appropriated in certain ways. Indeed, all design proposals in chapter 5 identify benefits towards the vast amounts of personal data held on databases for the positive value it can bring to personal remembering. Where Big Data is often discussed in relation to its value to organisations and companies, my research highlights its value to the individual, an aspect rarely considered, to positively enhance personal reminiscing and wellbeing. This value might be explored in future work through specific collaborations between memory support designers and experts in Big Data.

There are many ways experts of related subjects might use this research to extend their practice by considering the value of designed support for chance memories. Where

theories and literature has previously evolved through scientific research, my research presents the new and exciting potential and possibilities using design to discover can bring. New collaborations between experts of related subjects and designers could see more insightful discovery as a result of my recommendations, and the development of real-world offerings of designed, unexpected encounters with our memories.

Specific groups of end-users

My research presents many design interventions that extend and enhance personal reminiscing to specific groups of end-users, for example, people suffering with memory loss conditions such as Dementia or Alzheimer's, or people with a visual impairment. Early work discovered that non-visual cues to memories are valuable, especially to people with a visual impairment, and the process I adopt to explore the triggers to personal remembering episodes are valuable to developing this area further. Though my research into unexpected remembering moved design explorations away from focusing on non-visual memory cues, initial explorations show how other people could use these to develop more offerings of designed support for people with sight loss. My research on chance memories showed how involuntary memories are rarely cued by personal evidence of memories, more likely through encounters with triggers met by chance in the environment such as smells and sounds. This has obvious benefits to people with sight loss, as moving the emphasis of designed support away from personal archives of memory evidence, which are often supported visually, offers more accessible support.

The final recommendations presented in chapter 5 harness the potential of systems presenting impersonal content to people to cue unexpected remembering. Whilst not only finding this approach significant to supporting involuntary remembering (over a system using personal evidence of memories), it is of noteworthy value to people suffering from memory loss.

There is considerable potential to systems using impersonal content to cue personal remembering to people with Alzheimer's or Dementia, as there is less need to make specific connections to specific memories. Presenting generic content, such as a picture of a beach as used by the Circa system (Astell et al., 2010), may encourage people to think of their own memories of similar experiences of being on a beach. Discussing the value of impersonal content to unexpected remembering, there is clear application for developing this approach further for this specific end-user group. What other value might using impersonal content to cue remembering bring to people with memory loss, what other offerings could benefit this specific user group? There are many applications and settings

(for example, Car Boot Coffee Table, Holiday Window, Trending Shelf and Flickr World Map, presented in the design proposals in chapter 5) where my approach to personal reminiscing might bring positive experiences to people with memory loss, and future work could see collaborations with experts in this field to develop concrete offerings.

There are other groups of end-users that might benefit from applying the discoveries of this research to further personal memory support, such as older people living in a care-home using impersonal memory evidence to cue group reminiscing over their past[18], or people experiencing loss of their physical possessions (for example, a house fire destroying a lifetime of memory evidence). Could my approach for using impersonal content, understanding our universal memories and tapping into the power of people's imagination to cue remembering, alleviate some of the anxieties and distress leaving behind a lifetime of memory evidence brings? This shows how my research may support many different groups of end-users and key will be encouraging such collaborations in future work.

The future of involuntary reminiscence

Overall, my approach contests current support that focuses on prescribed and explicit moments of remembering; instead I promote designed experiences of lightweight, unexpected and serendipitous remembering. My recommendations and proposals establish approaches for populating this space and show how chance memories can be supported and enhanced through design. They map the design spaces identified as a result of my design explorations and illustrate the themes around chance memories to present inspiration for future exploration, presenting creative approaches for dealing with involuntary memory and new ways of designing support for personal memories as a result.

My research leads to many exciting possibilities for future development. Throughout, I propose designers go further in developing systems that mimic more aspects of natural remembering by referencing involuntary memory. Designers should consider orchestrating situations where reminiscing occurs unexpectedly, similar to how people experience involuntary remembering daily. Exploring these situations has provided a springboard for areas to develop and build on, and to expand on these themes holistically recommendations for future work include developing specific ideas.

Prototyping some proposals might help explore key questions and emerging issues in more detail, such as the potential consequences of designing for chance memories. One

[18] Similar practices can be found with reminiscence therapy (Webster & Haight, 2002; Bender et al., 1998) and also discussed in reported findings from residents of a care home using the PhotoStroller, developed by researchers at Goldsmiths Interaction Research Studio (Boucher et al., 2010).

issue to explore could be finding a balance with exposure to unexpected remembering as this seems key for sustaining support for chance memories over time: over-exposure could destroy its positive effect. A system prompting too many instances of involuntary memory may prove tiresome so considerations for how design might tackle this could prove valuable.

At the establishment of this new design space, the next steps are to explore the possibilities. Designing for chance memories offers greatly enhanced and extended experiences of personal memories and opens up many new spaces for imagining. It is an exciting design space that is ready to inspire a raft of newly designed memory experiences: future systems that go beyond planned, purposeful reminiscing and provide gift-like glimpses of our forgotten past. This is a whole new approach to dealing with personal memories, one that can push the boundaries of memory support into many new areas and opportunities waiting to be explored.

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