

Memory-storming: Externalizing and Sharing Designers' Personal Experiences

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ABSTRACT

In this paper, we describe memory-storming, a design technique that combines oral storytelling with sketching to externalize designers' personal experiences. The proposition behind developing this method is that designers' personal experiences are a potential design resource that can trigger new design insights and ideas. This paper provides a description of our use of this method, shows how it helped us in our design research, and presents lessons learned. We claim that memory-storming is a design technique that focuses on designers' personal experiences yet complements the user focus of user-centered design.

Author Keywords

Memory-storming, design, user-centered design, interaction design, storytelling, sketching.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Many studies assume that users' needs and experiences play a dominant role in product innovation [20, 21, 24]. User-centered design (UCD), has cultivated various methods to put users at the center of all phases of products and systems design to ensure that designs meet users' expectations. For example, research-based methods including field studies, interviews, and surveys, are used at the beginning of a design process to discover users' needs and requirements. Prospective use analysis [30] methods, like persona, storyboard, and use case, help designers construct mental models to help imagine future situations that may lead to alternate solutions for new technologies and interactive experiences [4]. Retrospective use analysis [30] methods use rapid prototypes or paper prototypes for usability testing to discover errors and areas of improvement of the proposed solutions. Therefore, UCD has led to remarkable

successes in designing interactive technologies and systems in interaction design and Human-Computer Interaction (HCI) and has established itself as the de facto standard for the design and development of quality products, systems, and services [31].

As designers, we support a user-centered design philosophy and also deem that one of our main responsibilities is to meet users' needs and exceed their expectations. But this doesn't mean our work need only draw on objective, third-party information, like findings from user research. Any relevant design resource, like designers' personal life experiences, which can facilitate designers' creativity and innovation, should be considered equally as a resource for design.

In traditional design fields, many design cases have demonstrated the validity of subjective design approaches. For example, Naoto Fukasawa's cellphone design (figure 1) is based on a personal childhood memory. Fukasawa, a respected designer from Japan, recalled his experience of peeling potatoes as a child: "when I was young, I was peeling a potato, and the dirt adhering to it disappeared as soon as it was washed, revealing the obtuse angles left by the knife in its round surface. That smooth surface and the obtuse angles felt good" [15]. By replacing the aerodynamic shape typical of technology products with "blunted edges" like that of the peeled potatoes, Fukasawa's cell phone has a form that comfortably is cradled in the hand and pleasantly reminiscent of his past memory. His childhood experience of rubbing the peeled surface of potatoes invoked the inspiration of the cell phone design. He thought the many chamfered edges of the cell phone would cause people to play with it unconsciously thus creating a more palpable connection with the phone. Additionally, many users may have had the same experience of peeling potatoes in their daily life but this kind of experience is hardly ever reported by users and is not easy to obtain through observation.

In addition, compared with other disciplines involved in HCI such as engineering and cognitive science, design is relatively speaking subjective [45]. Thus we should admit that designers' personal subjectivity is inevitably embedded into design processes.

In fact, some recent studies in HCI have turned their attention to explore how a subjective design approach can contribute to technology design. For example, Sengers proposes autobiographical design, which aims to offer

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richer experiences to typical users of a technology through designing for the designer himself and addressing the designer's own personal experiences [45]. In [16], Fantauzzacoffin presents a conceptualization process of a design of an infant soothing and a premature apnea therapy blanket, which draws heavily on designers' personal everyday experience, and uses phenomenological hermeneutics to theorize and validate the relationship between design and designers' personal experience.

Along similar lines, our paper introduces memory-storming as a design technique for externalizing and sharing designers' personal experiences from memory, such that other designers can understand, use, and modify their memories as a design resource. We argue that memory-storming is a design technique that complements and contributes to UCD.

In this paper, we first describe the background and motivation of this paper. We present related research on user experience to define the scope of designers' personal experiences referred to in this paper. Next, we introduce memory-storming through discussing related research on storytelling and sketching showing how together they can effectively access and externalize designers' experiences. We then portray our use of memory-storming and how it helped us in our design research in designing interactive tangibles that can support appropriation. Finally, we present lessons learned from our experience of memory-storming.



Figure 1. Fukasawa's cell phone design [15] as an example of idea generation inspired by a designer's personal experience.

BACKGROUND AND MOTIVATION

Our study of memory-storming occurred in the context of a larger research inquiry on everyday design [47, 48] and appropriation (not the subject of this paper). The aim of this larger inquiry was to explore an interaction design practice where appropriation is a central and inevitable phenomenon in the design and use of interactive technologies. In the context of everyday design, we see users as a type of everyday designer who remakes and modifies organizing systems, and who use design artifacts and their immediate surroundings as design resources to support their dynamic everyday routines and needs [47, 48].

Our own previous ethnographic studies [47, 48] and other studies from the fields of interaction design, HCI, Computer Supported Cooperative Work (CSCW), Workplace Studies and SST (Social Shaping of Technology) present

descriptions of how users appropriate physical or digital artifacts and systems [12, 25]. Additionally, the same research has discussed the importance of appropriation, and created theoretical frameworks to help understand appropriation and provide insightful design principles for future technology design [8, 9, 11, 17, 41].

However, there is a lack of practical and direct design advice or design strategies for designing technologies that can support appropriation as a main concern. As part of our research, we have explored several design approaches and experimented with them to help gain more insight into designing with appropriation. Memory-storming was one of the design strategies we developed. The proposition behind developing memory-storming is that designers' personal experiences are a potential design resource that can trigger new design insights and ideas.

EXPERIENCE

Experience in design is mostly discussed in the context of "user experience". The concept of "user experience" is becoming central to the fields of HCI and interaction design [19, 23, 50]. More studies on product and system design shift a focus from usability, effectiveness and efficiency to user experience. Law et al. [23] argues that "the immense interest in user experience in academia and industry can be attributed to the fact that HCI researchers and practitioners have become well aware of the limitations of the traditional usability framework, which focuses primarily on user cognition and user performance in human-technology interactions". Preece et al. [34] state user experience goals are concerned with how users experience an interactive product from their own perspective, rather than assessing how useful or productive a system is from the system perspective. And user experience can encompass nearly everything in someone's interaction with a product, from the text and font on a search button, to the overall color scheme, to the information layout, to the levels of customer support. How to define the actual scope of user experience is still under debate.

More broadly, experience is a stream of feelings, thoughts, actions and a continuous commentary on our current state of affairs [22]. Experience is ubiquitous, mostly unconscious, but still accessible to the person experiencing [19]. And "experience is partly an internal process, but it is more than the collection of psychological states undergone by an individual in a given situation. Experience contains external conditions and events, but it is more than merely something that happens to a person. In other words, it is neither exclusively an individual's subjective responses to a situation nor the objective conditions that make up that situation – and it is not merely the addition of the two" [32]. It is the "transaction or engagement that takes place between an individual and the world" [10]. So experience should include a person's active engagement in an activity involving the outside world, like material objects, other people and surroundings. A person is able to summarize and memorize particularly outstanding, rich, or touching experiences [19]. Memory is our ability to encode, store,

retain and subsequently recall information and past [49]. Therefore memory creates a frame of reference for accessing and retrieving our previous experiences. Both experience and memory are innately personal and so externalizing past experiences can be elusive.

In this paper, we define designers' personal experiences as their previous experiences emerging from past actions and interactions with objects, people and surroundings. We acknowledge that these experiences are personal and even emotional and so typically may not be considered relevant to one's own professional life as a designer.

MEMORY-STORMING TO EXTERNALIZE AND SHARE DESIGNERS' PERSONAL EXPERIENCES

Memory-storming is a design technique that combines oral storytelling with sketching for externalizing and sharing a designer's personal experiences from his or her memory. It can be used by an individual designer but we mainly used it within a design group for sharing designers' intangible and tacit personal experiences. Knowledge sharing can be a way to facilitate group innovation [35]. Memory-storming utilizes oral storytelling—the verbal recounting of experiences, and sketching, which is the visual representation of experiences. Thus, our approach possesses the advantages of both these methods.

Storytelling

Story is a common term for the recounting of a sequence of events [42]. Everyone tells stories both to himself and to others. Stories are a key social mechanism through which human history and experiences have been handed down from one generation to another. Compelling stories include fleshed-out characters; rich contextualized settings; goals (what the protagonist is trying to accomplish and why); causality; and obstacles (what problems the protagonist has to overcome to accomplish the goal) [18]. Dramatic elements, such as time locks (constraints on the time in which the goal must be accomplished) or option locks (constraints on the actions or items that can be used to accomplish the goal), heighten the dramatic impact of the story [3, 5, 18, 27]. Thus, a good story is more than just a transfer of information. It is an active mechanism for facilitating audiences to engage in its content, facilitating the creation of an immersive experience for audiences and the generation of empathy between an audience and a character in it. Therefore, in interaction design and HCI, designers create a variety of compelling and fictional stories based on actual user stories in different formats, like persona, storyboard and use case. They build these stories not only to help themselves immerse in the situation in which their technologies or systems will be used and thus to inform their design, but also to help multidisciplinary teams work together and to help end-users understand and discuss how a technology or a system would fit into their lives and what they would experience [18, 37].

However, in our study, we look back on our own past lives and use oral storytelling to recount actual experiences about objects used to inform our design, because we consider that:

- First, from a storyteller's perspective, it allows the storyteller to really relive the experience and recount the experience more precisely.
- Second, it constructs an interactive environment in which a storyteller and an audience can communicate with each other, so the audience can comprehend the stories more easily. Moreover, the communication may encourage the storyteller to recall more details about the experience and also may trigger the audience's memory of the similar situation.
- Third, from a data analysis perspective, stories allow us to understand experiences clearly and deeply and extract the information we need easily, because stories represent events and experiences in a coherent way through schemas that capture the relations and structures connecting individual details [38]. In other words, a story about a designer's personal experience is an entity that describes someone (who) interacts somehow (how) and for a certain reason (why) with something (what) at a given time (when) and place (where). So a set of WHO, WHEN, WHERE, WHAT, HOW, and WHY (for short: 5W1H) questions can help us analyze and categorize the information in a story effectively.

Sketching

Sketching, or hand drawing, has been a powerful tool for designers from various design fields to “transform intangible ideas to tangible information” [1] for others. Sketching is also viewed as the archetypal activity of design [6], which means we can gain insights about design by way of cultivating a better understanding of sketching [6]. For example, Schön in “*The Reflective Practitioner*” [39] describes “design as a reflective conversation with the situation” through studying a number of design protocols of teaching-learning sessions in which the instructor drew on a student's sketch while making suggestions about the student's architectural design. Although all design drawing can be considered as a vehicle of representing, communicating and sharing design ideas, designers employ the appropriate kinds of sketches to attain their varied purposes in different contexts and for different audiences. For example, *thinking sketches* [6, 46], which are the most commonly studied type of sketches, like in [6, 39], refer to sketches generated and developed in a designer's thinking process. In this process, designers develop their ideas by engaging in an interactive conversation with the paper on which they draw [40]. Figure 2 is Philippe Starck's original thinking sketches for his famous lemon squeezer, called Juicy Salif. The generation process of the squeezer's final form seems from the sketch at the bottom right of the figure and then it evolves into the final one at the bottom left in an anti-clockwise path. *Presentation sketches* [6, 46] are ones made to communicate design decisions to people who are outside the design process but are stakeholders of a project, like customers and clients, and who “usually lack the skill needed to read these drawings [like thinking sketch] and therefore understand what the product would be like before it is actually made” [36]. So presentation

sketches are really like a photograph of an object (see figure 3).

Although there are many kinds of sketching, the sketching used in memory-storming is different from all of them. Sketching in memory-storming is not drawing design ideas that are imagined or only half imagined in designers' mind, but drawing things from memory. It is also unlike the drawings done by artists from a model, because memories are a person's interpretation of the facts and not a record of them [43].

We involve sketching in memory-storming to elicit and express designers' personal past experiences inspired by research on art therapy, which is a modality that uses the nonverbal language of art for personal growth, insight, and transformation and is a means of connecting what is inside us (feelings, thoughts and perceptions) with outer realities and life experiences [28]. In this research field, drawing is always mentioned as the main and most economical method of connecting our inner and outer worlds [26, 28, 29].

For memory-storming, sketching can help storytellers to express some aspects of their experiences that cannot be represented verbally; it can allow audiences to understand and see the stories more clearly and directly; and it can help us retrieve the stories easily when we do data analysis.



Figure 2. Philippe Starck's original thinking sketches for his famous lemon squeezer [7].



Figure 3. Presentation sketch example—Ivo van Hulten's sketch [13].

MEMORY-STORMING APPLIED - A CASE STUDY

Memory-storming Process

We applied memory-storming in a design research experiment on designing interactive tangibles that can support appropriation.

Our aim was to identify a series of attributes from objects based on their forms, materials, and interactions in the hope that these attributes could inspire us to design our tangibles. In this case, these objects should be ones that have left deep impressions on our memory as designers. As designers, we were able to describe our experiences with objects whether they were recent or distant experiences. We were pleased to share these experiences.

Our memory-storming began with pairing designers together (in our case we had three pairs) to elicit and exchange memories of objects and their interactions. Primarily designers took turns exchanging stories orally while the other wrote down the keywords from the stories based on six questions we came up with. Designers were asked to recount their memories of experiences as detailed as possible. During storytelling, the designer listening to the other's story can ask questions and add their thoughts and comments. Each designer in the pair told at least three stories.

As discussed, we proposed six questions to help guide and focus the stories and exchange:

- Attributes: what attributes does the object have?
- Routines: what actions were you doing with the object?
- Materials: what materials was the object made of?
- Context: where and when was this action being taken place?
- Related: what does this object remind you of?
- Memory: does this object bring back other memories?

After the story sessions, we individually sketched each of the memorized objects and interactions showing form and the specific interaction as remembered. Sketches were quick and detailed enough to show interaction, and exploration of the material of the objects were presented as much as possible. For example, figure 4 and figure 5 are sketches drawn by a pair of designers who exchanged their stories. One designer recounted that he was always playing with the watchband fastener unconsciously (fastening/unfastening the latch repetitively), when he was talking to people in an office or in a coffee shop. In his sketch (figure 4), he depicted the watch fastener from different angles and showed the fastened condition of the latch. The other designer recalled going to a fabric store with her mom during her childhood. When she was bored and looking for something to entertain herself, she became attracted to the pretty colors of all the bobbins and played with the colors she liked the most. In her sketch (figure 5), she illustrated a scene of pushing a bobbin.

We organized the examples into *patterns* based on a previously published framework of *everyday design patterns* [47, 48]. We referred to this as a “pattern board analysis” which is similar to a trend or mood board in design.

In our particular case, we came to focus on examples that fit what we refer to as the *half-wall pattern* [47, 48], which is one of the patterns illuminating aspects of everyday design (the definition of this pattern is finding a use or new use of a structure in the environment [47, 48]). We printed examples of *half-wall patterns* and similar to our affinity analysis of our memory-storming sketches, we clustered examples into sub-patterns based on key attributes we assigned to each of the examples. We iterated and refined the process to the point where we had a small set of attributes we were pleased with from the point of generating design ideas. These attributes included “*flat*”, “*containment*”, and “*protrusion*”. “*Flat*” describes a half wall structure that is often used to leave objects on temporarily, and is commonly used for garbage (urban) or for allowing objects’ access later (see examples on the top of figure 8). “*Containment*” describes a half wall structure that indicates boundaries for holding and containing objects. These boundaries can be walls, borders, end of a flat surface, and so on (see examples in the middle of figure 8). And “*protrusion*” describes any subordinate component of a structure that is used to hang and hold other objects (see examples at the bottom of figure 8).

We then mapped the results of both processes (memory-storming and pattern board) to each other to further refine and redefine attributes that we could use as more direct guides for designing interactive tangibles.

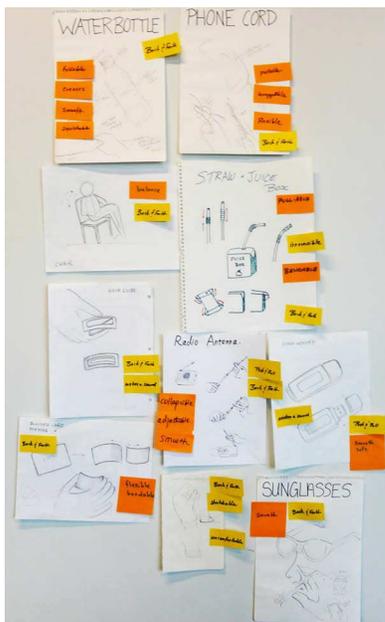


Figure 7. An example of affinity analysis of memory-storming sketches—objects were classified in a category called “back and forth”.



Figure 8. Examples of objects (from top to bottom) from 3 categories: “*flat*”, “*containment*” and “*protrusion*”.

Examples of Design Results: Interactive Tangibles

Our design of interactive tangibles began with conceptual development including their physical forms, scales and interactions. For some tangibles, we also considered their materials. The whole design process, from “generation, evaluation, selection to polish”, was directed by the attributes of the synthesis of memory-storming and pattern board analysis. After this stage, all the final ideas were implemented in 3D modeling and 3D printing. We then sanded and painted the prototypes. And finally electronic components were mounted inside the artifacts.

In the following part, we present three examples from the interactive tangibles we designed to illustrate what attributes contributed to their design, how we applied these attributes and in what ways they may encourage and invite appropriation to occur.

Hook

This tangible was designed with the attributes “*protrusion*” and “*making a signal*”. Along with the hook, we included flat surface along the ‘bulbous’ part of the tangible, allowing the interactor opportunities for laying it in various positions.

The LED inside was turned on based on a tilt sensor. If the tangible was tilted with its hook facing down (counter to what would work better, which is with its hook facing the other way), the LED would light up green. The LED would not light up however, if the tangible was placed in any other

position creating further speculation as to its use and purpose. Rice was used to transfer the tangible's center of gravity for balancing (see figure 9).

For most people, the simple functionality of the object and how it can be controlled is clear, but its ultimate purpose, meaning and usefulness are left open for them to decide, thus leaving it open to appropriation.



Figure 9. An example of design results--Hook.

Spoon Rock

We designed this rock with the attributes “*containment*”, “*back and forth*”, and “*making a signal*”. The combination of these attributes inspired us to open up appropriation of the tangible through making the familiar unfamiliar. In other words, people may have an assumption that a more distinct cavity of this tangible could store something based on their past experiences. But our design challenged this assumption through making the rock off balance once artifacts are placed within it (see figure 10).

To add more confusion, a tilt sensor along with a cellphone vibration motor (powered by a 3V battery) were embedded within the rock. The rock vibrates when it is placed bowl up. The only way to shut the vibration off is to turn the rock upside down.

In this design, driven by the three attributes, the precise representation of the ‘bowl’ creates both side effects and inconsistencies that don’t correlate with people’s expectations of the artifact. So in this way the artifact may trigger new thoughts and actions that can lead to appropriations.

Flat Rock

This tangible was designed with the attributes “*flat*”, “*containment*”, and “*making a signal*”. It could ‘contain/hold’ objects afforded by the slight concave groove in its center. The two holes in it allows for it to be hung and displayed for various purposes.

The electronics we embedded in this particular tangible included a blue LED that was turned on if there were any

vibrations sensed from certain areas, which was sensed by a piezo-input sensor. And the light was also inconsistent, which was controlled by an arduino board powered by a 9V battery (see figure 11). We hoped the uncertainty of the lighting in this tangible would make users curious about its actual functionality and aware of its inherent limitation, thus opening a space of possibilities for its use.



Figure 10. An example of design results--Spoon Rock.



Figure 11. An example of design results--Flat Rock.

Lessons learned in using memory-storming

We collected almost sixty stories about our personal experiences in two rounds of memory-storming. For each round, we spent about 2 hours on the whole process including storytelling, sketching and data analysis.

Analyzing the stories to extract the main attributes of each object designers talked about was easy and efficient, because all the stories came from our own life and we were familiar with every detail of the stories. In addition, the sketches we drew did make our data analysis more convenient, because as design representations they yielded fast access to the value of the stories. Most importantly, we gained insight into our own experiences with everyday objects that we didn't pay enough attention to before, especially some unconscious interactions with the objects. We were also excited that the final attributes based on our

process made our design direction clear and focused, and many interesting tangibles were generated.

In this case, memory-storming was an effective design technique helping us progress our design research. However, memory-storming as a technique has room for improvement. In our reflection on the process, our group shared views on the flaws in our approach and use of memory-storming.

First, the six questions in our protocol affected the coherence of the storytelling process, because almost everyone paid more attention to answering the questions, rather than focusing on telling compelling stories. We originally intended to enjoy the act of telling a story and to allow the exchange between paired partners to elicit as many details as possible, but the reality was that storytelling and dialogue was constrained by the questions. We think this flaw would be more obvious if storytellers were end-users since they would be more afraid of not providing “correct” answers to the questions.

Second, we conducted some of the sessions in a lab environment. To some extent, this context was not appropriate for storytelling. Other sessions were held in a café, and this more relaxed and social environment allowed for a more free flowing exchange. As we all have experienced being with friends in a café, stories are told unselfconsciously and with greater enjoyment. For those in the lab, designers felt self-conscious at times and found themselves “racking their brains” trying to recall experiences they thought were interesting and could contribute something to our project. Thus, environment plays a key role in storytelling and it may be one of the factors that influence the richness of storytelling. Ocha and Capps argue that people can find sharing stories to be a natural, effortless, and compelling experience, if given the right social environment [32].

Aside from these two drawbacks, we present another two points that are important for memory-storming from our point of view. First, the sequence of conducting storytelling and sketching may influence the details of stories. We are curious about the result if we tell stories and draw sketches simultaneously. Some research suggests drawing sketches while storytelling can increase memory retrieval [26] and thus we could get richer more vivid experiences. The other point is about sketching. The advantages of sketching for representing experiences are manifest. But not everyone feels confident about his or her sketching abilities. Even some designers in our own lab/studio felt frustrated when asked to draw the experiences. It is important to note that we don't look for refined design ideas in memory-storming, so everyone involved in memory-storming should be encouraged and informed that skilled sketching is not necessary.

DISCUSSION

Memory-storming is a design technique that supports designers' access to their personal experiences that may contribute to a design project, but may escape their notice, remaining on the margins of their awareness. Although the rationalist legacy of traditional HCI does not recognize the validity of using designers' personal experiences in design [16], it's undeniable that such an approach does happen in design practice [16, 45].

Some people may misinterpret our goal of developing this technique. They may assume we support designer-centered design at the expense of user-centered design. We consider memory-storming as a complement to UCD. We encourage its use in the situation where designers want or need extra design inputs as inspirational resources and they have the confidence that design decisions based on their personal and subjective experiences will be consistent with or add to the intended users' needs and expectations.

In our particular design case, we adopted memory-storming to identify interesting attributes from artifacts that designers experienced. However, in fact, memory-storming aims to bring designers' implicit aspects of experiences into the foreground of awareness to help and encourage designers to share such experiences with other team members, and then get inspired. In this regard, it can be used for various projects in which designers know what design insights they want to gain from their own experiences.

As a design technique, memory-storming is not a perfect solution, but it could help designers approach their personal experiences and then benefit from these experiences. Compared with other sources of design inputs that are external to a designer, the designer is inseparable from his own personal experiences, which include not only facts and events but also the relevant understanding, judgments, interpretations, and emotions, so that he or she can easily transform such experiences into design concepts. To some extent, using designers' personal experiences in design practice is similar to “the empathic approach, which builds on inspiration achieved from a rich understanding of people's experiences, dreams, expectations, and life contexts and is developed through a meaningful emotional encounter between designer and user” [51], like ethnography. The difference between them is the empathic approach draws upon designers' first-person experiences of third persons.

CONCLUSION

We developed a design technique, memory-storming, which combines oral storytelling and sketching to externalize and share designers' personal experience. It was motivated by our design research exploring how to design technologies that can support appropriation.

As a subjective design technique, memory-storming provided us with a different perspective to explore a problem and had progressed our research. We considered it as a complement to UCD. In fact, memory-storming could

also be used in user study for helping with understanding users' experience.

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