Understanding the Role of Designers' Personal Experiences in Interaction Design Practice

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ABSTRACT
Using designers' personal experiences in interaction design practice is often questioned in a predominantly rationalist practice like HCI and professional interaction design. Perhaps for this reason, little work has been conducted to investigate how designers' personal experiences can contribute to technology design. Yet it's undeniable designers have applied their personal experiences to their design practice and also benefited from such experiences. This paper reports on a multiple case study that looks at how interaction designers worked with their personal experiences in three industrial interaction design projects, thus calling for the need to explicitly recognize the legitimacy of using and better support of the use of designers' personal experiences in interaction design practice. In this study, a designer's personal experiences refer to the collections of his/her individual experiences derived from his/her direct observation or past real-life events and activities, as well as his/her interaction with design artifacts and systems whether digital or not.

Author Keywords
"Interaction design practice; designers' personal experiences".

INTRODUCTION
'Experience' has become a buzzword in the fields of interaction design and HCI over the past two decades. It is mostly discussed and studied in the context of 'user experience', which depicts individuals' subjective feelings and thoughts while interacting with digital artefacts. However, despite being the creators of such digital artefacts and equally emotional beings, interaction designers' personal experiences have not received much attention. In particular, little work has been carried out to investigate how interaction designers' personal experiences can contribute to technology design. This might be because "the rationalist legacy of traditional HCI does not recognize the validity" [7] of using designers' personal experiences in design. Even thought, some researchers have argued designers incorporate their personal experiences in their design work [7,23].

Therefore, this paper seeks to develop a case-study understanding and description of interaction designers' manipulation of their personal experiences in real-life interaction design practices as well as their perception of such design activities, and thus call for the need to explicitly recognize the legitimacy of using and better support of the use of designers' personal experiences in interaction design practice.

This paper provides two contributions to HCI and interaction design communities. First, it complements and expands existing research on designers' personal experiences, and brings some less acknowledged parts of interaction design practice to light. This includes designers' different perceptions of their use of personal experiences, the influence of designers' power in making design decisions in a design project on the usage practice of personal experiences, as well as how designers communicate personal experiences to their team members. Second, it demonstrates the legitimacy of designers' personal experiences in interaction design practice, and opens up opportunities for future research.

About this Paper
In this paper, interaction design practice refers to "professional design activities intended to create commercial products" [10]. A designer's personal experiences refer to the collections of his/her individual experiences derived from his/her direct observation or past real-life events and activities, as well as his/her interaction with design artifacts and systems, whether digital or not, in professional and personal contexts. For example, designers relayed their personal experiences of using an iPhone or Facebook, or the experience of being in an audience at a musical festival, or travelling in a foreign country. In addition, in this paper, a designer's personal experiences are separated from his/her professional design experiences. Professional design experiences refer to the accumulated

experiences of a designer mastering competence in developing products and systems over a period of time from training to professional practice. However, one's use of a product that he/she has designed or products designed by others would count as a personal experience, since it goes beyond the act of creating or designing that product to actually using it. Also, it should be noted that our position in this paper is not to objectively classify designers' personal experiences. Further we understand that designers' personal experiences may intertwine with their professional experiences and that it is not easy to separate them. Nevertheless, for the purpose of this study we define personal as distinct from professional experiences. More importantly, our aim in this paper is to describe the role of designers' personal experience in general, acknowledge its impact on professional design practices, and interpret these findings in terms of the opportunities they suggest for future research and practice. In addition, some researchers may question the value of our study, and argue it's very common for designers to use their personal experiences in design practices. However, in terms of our observation this common fact is less articulated in formal research of HCI and interaction design, receives little acknowledgment in professional design practices.

This paper has four parts. In part one, we describe relevant design research in order to present motivations for carrying out this study. Next, we describe the methodological approach adopted in the study, and present the detailed procedures of data collection and analysis. We then present findings generated by data analysis, and discuss the implications of such findings for interaction design practice.

RELATED WORK

In this section, we review related research to this study, which is neither exhaustive nor conclusive, but rather helps to illustrate our motivations for conducting the study.

Existing Research Related to Designers' Personal Experience

Design is complicated work. It often happens in the situations in which infinite "sources of information, requirements, demands" [26] and limited "time and resources, knowledge and skill" [26] intertwine together. Designers need to handle such complex situations and balance various aspects of design, such as "attractiveness, sensuality, aesthetics, functionality" [27] and usability in order to create true innovation. Therefore, it's not surprising that much of the existing research on designers focuses on their cognitive activities and processes (e.g., [2,4,5,12,22,24]), as well as developing techniques or tools to support the perceived cognition underlying creative activities (e.g., [19,21,25]).

Only a limited amount of design research has focused on designers' personal experiences.

Fantauzzacoffin [7] presents a conceptualization process of a design of a premature apnea therapy blanket, which is driven primarily by the designer's personal everyday experience. In this situation, the designer's personal everyday experience includes her childhood memory of the charm bracelet her grandmother and other neighborhood women wore and her own experiences with her infant who was sleeping prone on a parent's chest. Fantauzzacoffin uses phenomenological hermeneutics [1] "to theorize and validate the relationship between design and experience". Fantauzzacoffin says "the purpose of this presentation is to instigate by giving an example of valid practice from processes that defy validation in the rationalist paradigm".

Sengers [23] proposes "autobiographical design, or the design of technology with respect to details of its designer's personal experiences, as a promising approach for bringing richer aspects of experience into design". The proposition behind this design approach is that "individual, idiosyncratic experience can be a valued contribution to design" [23]. Here the designer's personal experience is defined as one's own present life situation for which a design can be created.

Neustaedter and Sengers [18] extended their previous research on autobiographical design and interviewed HCI experts who have designed a system with themselves as target users and have evaluated the design through their own self-usage. Their aim was to "draw out the possibilities and limitations of the autobiographical design method" [18]. The authors pointed out autobiographical design method would be best used when design practitioners have genuine needs and real systems for long-term use. In this work, personal experience refers again to one's own life situations that a design can be created to support, be it at work or at home.

Similar to autobiographical design method, Erickson [6] reports a reflective analysis of his design and use of a personal electronic notebook called Proteus. For Erickson, personal experience refers to his everyday work practices, including taking notes in meetings, recording design ideas, etc., which informed the design of Proteus. Gaver [9] presents a first-person account of his design of Video Window, which is a video screen in his bedroom showing the skyline from outside his window. Through simultaneously living with and continually designing the system, Gaver argues that although the system is simple, it has taught him about "the intermingled aesthetic, utilitarian, and practical issues involved in" both creating and experiencing the system [9]. In this work, the designer's personal experience refers to both the author's own and his family members' experience using Video Window.

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[1] Phenomenological hermeneutics is a "research methodology aimed at producing rich textual descriptions of the experiencing of selected phenomena in the life world of individuals that are able to connect with the experience of all of us collectively" [1].

Discussion

Although at present there is a dearth of design research on designers' personal experiences and designers' personal experiences mean different things to the researchers, the work reviewed above illustrates: (1) designers' experiences can contribute to technology design; (2) experts in interaction design and HCI do utilize them in their own design or research; (3) researchers in interaction design and HCI have begun their endeavor to bring the black-boxed and concealed aspect of interaction design practice to light.

Thus, as members of the community of interaction design, we feel there is a need to describe and reflect on how interaction design practitioners in industry work and interact with their personal experiences in interaction design practice. The related work in this section illustrates that personal experiences have been defined as those involving personal life situations at home, or personal day-to-day working activities.

Practice-based Research

Recently, researchers in the field of interaction design have begun to advocate practice-based research to produce outcomes that can effectively support interaction design practice. In part, this is due to observations of the mismatch between HCI research and its influence on interaction design practices. As an example, in 2004, Rogers [20] conducted a small online survey among 60 practitioners in the U.K. and the U.S. The purpose of the survey was to explore "what practitioners think the role of theory is in HCI and their perceived need for theory in the work they do" [20]. The result of the survey shows that "even though practitioners are familiar with many of the recent theoretical approaches (e.g., activity theory, situated action), they do not use them in their work because they are too difficult to apply. Moreover, it is not that they do not see them as potentially useful, but that they do not know how to use them" [20]. Stolterman argues, "science is not the best place to look for approaches and methods on how to approach design complexity" through comparing "the notion of complexity in science and in design" [26]. He assumes understanding of the nature of design practice is the basis of any interaction design research aiming at sustaining design practice [26]. Goodman et al. [10] give an overview of "two decades of publications that suggest a lack of synchronization between HCI research and interaction design practices", and also present a six months study of commercial design practice in San Francisco's Bay Area to illustrate design issues at hand. They "contend there is a need to produce theories of designerly practice that are resonant with the everyday work of interaction designers" [10]. Liikkaneen et al., who consider creativity as the everyday routine of designers, argue that a practice level of "scientific interest is largely absent in research on creativity in design", and propose that "a practice-based approach for design research" can "yield several insights into professional designers' productivity", and thus could suggest "design tools for both practitioners and students in the future" [14].

Overall, this work serves as evidence of the interaction design and HCI communities' need for more research on understanding real-life design practice; a need that led to our study.

Empathy

Designers and researchers in the fields of interaction design and HCI have given much attention to empathy and empathic design in recent years. One reason for this is they believe that the closer designers could get to their users' lives and experiences, the more likely that their products and services could meet the users expectations and needs. Thereby, considerable research related to empathy has emerged in design literature, such as [3,13,15,28].

Kouprie and Visser [11] have given an exhaustive review of such studies, and grouped them into three categories in terms of how the researchers view empathy in the context of design. They propose some of the research "addresses empathy as a quality of a design process", some considers empathy "as an ability people have, and differs for individuals", and some focuses on describing a variety of empathic design techniques, such as observation, persona, storyboards, role-playing, body storming, and so on [11]. Based upon the review, Kouprie and Visser argue that the existing research doesn't clearly explain "what empathy in design is and how it can be achieved". Therefore they examine "the psychological literature" to see how psychologists define empathy [11].

According to Kouprie and Visser [11], some researchers in psychology believe empathy "takes place when the boundaries between the empathizer and the empathee disappear", but some advocate "the boundaries should not disappear". These two opposite views position the empathizer differently in the empathizer-empathee relationship when empathy happens. In other words, to attain empathy, the former view considers that the empathizer should "become" the empathee to experience the empathee's feeling, but the latter considers the empathizer only needs to "stay beside" the empathee to understand the empathee's feeling. So the former emphasizes the "affective" aspect of empathy, but the latter highlights the "cognitive" aspect of empathy. In fact, these two views are echoed by some of the existing empathic design techniques separately. For example, "when observing the user in the user's environment, the designer *stays beside* the user"; and in "role-playing the designer can *become* the user for a moment" [11].

As for Kouprie and Visser, they argue design empathy should include both views, and they consider design empathy as a process consisting of four phases:

- *Discovery*. In this phase, the designer "enters the user's world" [11].

- *Immersion*. In this phase, the designer "wanders around in the user's world" and obtains his own experiences [11].
- *Connection*. In this phase, the designer "connects with the user by recalling explicitly upon his own memories and experiences", and "resonates with the user's experience" "in order to reflect and be able to create an understanding" about the user from his own perspective [11].
- *Detachment*. In this phase, the designer "leaves the user's world", "steps back into the role of designer", and furthermore reflects what he has experienced in the user's world [11].

So in Kouprie and Visser's model of design empathy, the second and third steps describe how designers first engage in the users' world and *become* the users to gain their own experiences of the users' world, and then *stay beside* the users and communicate with them to achieve "emotional resonance" [11] through bringing in their (designers') own experiences.

Concluding, from Kouprie and Visser's model of design empathy, we can see designers' personal experiences of the users' world plays an important role in design empathy. And thus, to some extent, using designers' personal experiences in design practice is similar to the empathic approach. But the difference between them is that the empathic approach draws upon designers' personal experiences of third persons.

In summary, our study is motivated by the various related strands of research discussed above, but also differs from and extends them through deeply examining how designers' personal experiences are incorporated into interaction design practices.

RESEARCH METHODOLOGY

This study took a descriptive and multiple case studies approach to examine the research question. Case study approach is useful in exploring and describing a social and cultural phenomena in depth and producing understandings of how the phenomenon is shaped by its unique circumstance [29]. In addition, the cases of this study were defined as interaction design projects, which occurred in industrial settings, and in each case, interaction designers involved in the project were different subunits of analysis (which means the subunit of analysis as the designer includes the designer's occupation, job role, and activities as a part of the design work).

The selection of cases followed "a 'replication' design[2]" [29], and the choosing criteria are present as follows:

- Investigators of this research could obtain permission from project managers to study their projects.
- The design team of the project should include at least two interaction designers.
- The investigators have access to at least two interaction designers involved in the project, in order to facilitate data triangulation.
- Among the participants in each case, one of them needs to be the design leader. This is because a project design leader can provide more detailed information about the project, due to his/her deep and overall understanding of the project.
- Apart from the design leader, the other participants involved in each case need to be the interaction designers, who are highly involved in the design of the project, because these designers may offer more stories about how they use their personal experiences in the project.

Cases and Subunits of Analysis

In terms of the selection criteria, three interaction design projects in industry were chosen for this study. Within each case, the design leader of the project and one interaction designer who was one of the key contributors to the design of the systems participated in the study. Due to ethical consideration, the real names of these projects and participants are not used in this paper. The projects are identified as Case A to Case C, and participants are identified as Designer 1 to Designer 6. They are briefly described below:

- Case A was carried out by a subsidiary of an international software company, which is located in Vancouver. It aimed to design a collaborative working tool for a multiple business domain. In this project, Designer 1 was the design lead of the user experience team. His educational background is in interaction design, and he has worked as an interaction designer for 12 years in industry. Designer 2 was an interaction designer in the project. His educational background is also in interaction design, and at the time of the study he had 7 years of experience in interaction design practice.
- Case B was conducted by a research lab, which is located in Bangalore. The lab is a part of the research center of a large global telecommunication, Internet, and software company. The aim of the project was to design a mobile-based system to track the spread of malaria in rural areas of India. Designer 3 was the design lead of the project. His educational background is in human-computer interaction, and he had almost 6 years of interaction design experience in industry. Designer 4 set up the project and was the project manager. His educational background is also in human-computer interaction, and he was a mobile user experience professional with nearly 10 years of experience in industry.

[2] A "replication" design means the multiple cases of a study are treated as multiple experiments instead of multiple respondents in a survey [29].

- Case C was carried out by the Vancouver office of a large-scale international non-profit software organization. The goal of Case C was to design an add-on for a web browser, which can allow people to share links in a fast, easy and fun approach without leaving the current page. Designer 5 set up the project, and worked as the user experience lead and product manager. His educational background is in computer science and psychology. He had been practicing as an interaction designer for 8 years. Designer 6, who holds a communication design degree, was the user experience designer in the project, and he had 3 years of experience as a professional interaction designer.

Data Collection

In this study, data collection followed a case study protocol[3], and consisted of several stages:

- *Email questionnaire*. A questionnaire including a set of questions concerned about participants' education and professional working experiences was sent before interviews via email. Designers were asked to email the results back before their interviews so that we could have an overview of their background that helped our preparation of the interviews.
- *In-depth interviews*. In-depth interviews were carried out at scheduled time and venue, which were determined by designers in advance. A semi-structured interview method was adopted, and a series of questions created in the case study protocol was used as a reminder. All the interviews were recorded by a digital audio recorder. The in-depth interviews for each case took place in two phases. In phase one designers were asked to talk about their general opinions about applying designers' personal experiences in interaction design practices and the experiences of using their personal experiences in the projects this research studied. If one designer in phase one shared his story about how he incorporated his personal experiences in the project, in phase two we would interview the other designer who was involved in the same case to elicit his opinion about the design decisions related to the first designer's experiences. Questions asked in phase two for each case varied depending on the stories designers shared. Each interview in the two phases lasted about one hour, and the number of interview times with each designer differed, depending on whether they had used their personal experiences in their projects.
- *Supplementary data collection*. After each interview, we asked designers to email us materials relevant to their projects, such as project progress reports, project presentation slides, the link to the internal project website, conference papers and online articles relevant to the projects, photos they took during the design process, system demos and screenshots, prototypes, and anything they were able to provide. Such kinds of data were then used to corroborate and triangulate the interview data.
- *Follow-up interview or email.* A follow-up interview or email occurred when we needed to clarify the data collected in the in-depth interviews during the data analysis process.

Data Analysis

Following data collection, interviews were transcribed, and a formal database for this study was built. After that, text data (e.g., interview transcripts, project progress reports, and conference papers) were "fractured" [16], and rearranged into different categories based on a series of questions. The aim of this categorization was to identify and classify the related data of this study.

Then, three word tables were built to display different evidence for subunit level (designer) analysis. The first table was intended to show designers' background information. The second table was designed to present designers' descriptions of their usage practice of their personal experiences as well as other types of evidence that supported or denied what designers said. The third table was created on the basis of the second table. More columns were added in order to display more data that were also related to the ways in which designers worked with their personal experience. To fill these tables, we reread the categorized data repeatedly. After finishing these tables, we started to look for patterns relating to the usage practices of designers' personal experiences as well as designers' perceptions of such practices. Six patterns emerged through iterative comparison, contrast and synthesis within and cross the contents of the three tables.

Afterwards, another two word tables were created for case level analysis. One was used to show project information (e.g. project type, project scale, project team) , and the other was designed for looking for patterns on the case level. Three patterns generated based on a process similar to the subunit level analysis.

FINDINGS

Designers' personal experiences have been applied in the three cases, but the detailed practices varied from designer to designer, and from case to case. In the following sections, we present some of the patterns emerging in data analysis. These patterns go beyond describing designers' personal experiences as resources for design inspiration

[3] A case study protocol includes instruments, field procedures and general rules that need to be followed during a data collection process. For this study, the essential interview questions and the field procedures of data collection designed in the case study protocol were evaluated in a pilot study, and then refined for formal data collection.

(which has been presented in existing work, like in [6, 7, 9, 23]). They focus on illustrating designers' perception of their use of personal experiences in design practice. For such patterns, they are elaborated in a narrative way, and their supported evidence is presented subsequently. Due to the confidentiality of some of the project documents, prototypes and system screenshots that participants provided, we cannot present them in this paper as evidence. But direct quotations from the case study interview transcripts are used a lot in order to prove the pertinent patterns and to assist readers to better understand how the interviewed designers used their personal experiences in their design practices. The interview data has been triangulated and corroborated by other types of evidence in data analysis wherever possible.

High-level Design Pattern

Designers were confident of working with their personal experiences when their jobs were more related to high-level design[4].

This pattern was seen in all three cases. In Case A, Designer 1 maintained that his day-to-day experiences of doing collaborative work had driven about 95% of his awareness of what 'hygiene feature[5]' should be built in the product of Case A without user research. He took email and meetings as examples to illustrate his argument. He said

I spend most of my time in doing collaborative work in two ways: I sit in meetings, ...or I use emails. ... We built [the name of the product], and we want people to go use that to do collaborative work. The problem is that I am already doing my work in certain ways, and most people do their work with emails and meetings. So when we think about how [the name of the product] should be designed, it's really important that it works ... really well with the tools we already use. ... So I would say that 95% of my take on, what should and should not go in to [the name of the product] is driven by my personal experience. (Designer 1)

In Case B, Designer 3 described his childhood experience of the trust relationship between his family members and their family doctor. He said that this experience supplemented what he experienced during the research phase of Case B (there was a lack of trust among health worker, doctors and health authorities), and insisted his experiences of both trust and distrust made him believe that creating trust relationships between disease surveillance stakeholders was a fundamental part of designing the system.

You can realize the value of trust by either experiencing trust or experiencing mistrust, ... in my case, both of these things happened. ... I realized the trust by my childhood experience. In the field, ... it was not concerning my life, but I saw it happening in someone else's life, so I could compare both. ... Then I thought 'ok, if my system has to be accepted, then we must solve these issues or minimize these issues.' And hence trust became a very important part of my system. In a certain way, I mean I didn't want to design a trust-based system, but I thought trust would be a fundamental part of my system. (Designer 3)

In the same case, Designer 4 affirmed that his experience of living in several different countries was one of the factors which allowed him to acquire a sensitivity for different types of cultures. And it was such sensitivity that drove his determination to conduct Case B in India.

In my past, I have spent a lot of years in the UK, and then in the US, in Finland and then in India. I had also done some user research in lots of countries, like China, Brazil and so on. All in all, I would say that in the course of my life, I have acquired this kind of sensitivity to different types of cultures. So in this particular case, ... as a leader of a team, ... I could have many choices. I could select projects that could be conducted in a traditional environment that all of us were used to operating in. ... But I chose to develop this system for rural area of India. (Designer 4)

Furthermore, he also deemed that his experience with making pragmatic decisions helped him to determine how much research should be done for Case B.

A kind of personal life experience that I have come to notice is when you are making decisions, ...you never have proper resources or time to analyze things over and over again. Therefore, sometimes it's really about making pragmatic decisions. Similarly, in this project, there was a sense of pragmatism. ... We didn't have full time to conduct ethnographic observations into the disease surveillance system. ... As an essential, we had the experts' interviews and we went to the site to study health centers and so on. But still, we didn't have a 360 degrees understanding of the environment, but ... we had to make a decision and needed to have a confidence that 'ok, this is now enough. And now we trust that we know enough and we jump to the conclusions and then we develop something. (Designer 4)

In Case C, instead of acquiring prototyping skills from his design education, Designer 5 noted his childhood Do-it-Yourself (DIY) experience with his grandfather gave him a deep understanding about prototyping. This understanding inspired him to adopt prototyping as a main design technique for Case C. He encouraged the design team to use

[4] In this study, high-level design refers to the design work, such as making decisions about when and where to do research, choosing a design method or technique, creating design principles, figuring out features or components of software, creating design goals and so on, which is often conducted by the design lead of a project.

[5] 'Hygiene features' refers to common or fundamental features expected by users. In other words, if these features were designed into a system, users would not necessarily be aware of them but if they were not included there would be a serious problem and this would be noticed.

different materials, like paper, OmniGraffle, and HTML, to create different versions of prototypes, aiming to achieve the design solutions they satisfied.

My grandfather was a tinker, he was a very innovative person. ... He looked at everything as if it had 90 different purposes. ... He used lots of different pieces of random things to accomplish whatever goal he had. ... I was constantly learning from the way he was working on his workbench. ... So my strongest design process step is prototyping because I inherited from my grandfather this way of seeing everything. ... For me, I like to do prototypes using different materials, like paper, OmniGraffle, html. They like different versions of the prototype in different context that let you get closer to what you are trying to accomplish, ... and that let you learn something new on each step. ... And that's the part about prototyping that I think I didn't take from school. (Designer 5)

Detailed-level Design Pattern

Designers were unsure about or unaware of their actual activities of using their personal experiences in their design practices when their work was more relevant to detailed-level design[6].

This pattern emerged in Case A and Case C. In Case A, although Designer 2 admitted his experiences of using contemporary products in the market had an impact on his design work, he was unsure about when, where, and how he applied such experiences in the project. And it was also hard for him to articulate what experiences were used and why they were used. He just knew he actually did that. He thought that such kinds of action might occur subconsciously.

Of course I use my first person experiences in things that I design. ... But I find it's hard for me to think and tell you specific examples, because I am unaware. ... I can just recall the action because I think that happens. (Designer 2)

In Case C, Designer 6 acknowledged designers' personal experiences of technology had an impact on their own design. But he thought he didn't apply such kind of personal experiences to his design work in the project. However, from the prototypes he created during the design process (see Figure 1), it seems that the look and feel of the interface is not very unique. There are some vestiges of the design elements from existing technologies. It should be noted that the difference between what he said and what he actually did in Case C was found in subunit level analysis, specifically when we were filling the data tables and doing data triangulation.

[6] Detailed-level design in this paper refers to the design work, such as designing wireframe and interaction flow of a product, doing visual design for an interface, which is carried out by an interaction designer or a visual designer in a design team.

I would say that there were many first person experiences going into this thing. But it's hard to say how much myself really like to put first person experiences into this thing. ... In terms of anything specific that went into this project, I can't think of anything that was really stands out. (Designer 6)

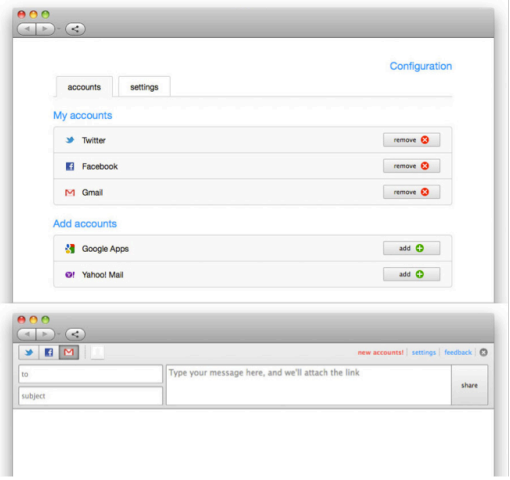

Figure 1. A prototype created by Designer 6 in the design process of Case C.

Authority and Opportunity Pattern

Designers' authority to make design decisions affected the opportunities they could have to utilize their personal experiences in their work. Specifically, designers involved in a project who had relatively more influence over design decisions had more opportunities to use their personal experiences.

This pattern generated through comparison within and across the three cases. In Case A, Designer 1 said about 95% of the 'hygiene features' of the system came from his day-to-day collaborative working experience. However, Designer 2 noted that he once proposed a 'hygiene feature' called calendars based on his personal experience, but because he didn't have the authority to make design decisions on product features and failed to persuade product owners and the design lead that this feature was necessary for their product, the feature was not included in the product until one product owner provided a request to build such a feature. In this project, only product owners and the design lead (Designer 1) have the right to decide what design features should go into the product.

A year and a half ago, I was talking about the need for calendars with product owners, saying 'we really need to do this', but they weren't interested. Then about 2 months ago, the owner of the project said 'we need calendars', and now that's an important thing to do. (Designer 2)

For Case C, in terms of what we have presented in *High-level design pattern*, we know Designer 5's DIY experience drove him to choose prototyping as the main design technique. One reason why he could make such a design

decision based upon his personal experience might be because he is the principal designer for both the entire company and this particular project.

I think that's because they were looking for that direction from me. They were probably not questioning, like why we are taking this approach or why we are using this design method. (Designer 5)

Hence, from Case A and Case C, we can see that designers who had relatively more influence over design decisions had more opportunities to use their personal experiences. As for Case B, the two designers were responsible for very different jobs and had relatively even power to make decisions about their own work, so the experiences they used and the related aspects of design practice were apparently diverse. However, we can still conclude that designers' decision-making authority in a design project is one factor that influences the use of their personal experiences.

Communication Pattern

Designers reported a tendency not to share their personal experiences (ones they applied in their projects) with their team members as rationale for their design judgments, but to communicate the design judgments or design decisions based on other reasons.

This pattern is observed in the three cases as well. Designer 3 in Case B attributed such oblique communication approach to his personality. Other designers didn't clearly and explicitly explain their reasons.

I am not an extrovert in terms of personalities. So I would rather keep my personal experience very personal. (Designer 3)

Moreover, we found that the ways in which designers communicated their design judgments varied. Designer 1 in Case A chose to transmit his superior's order once the superior had agreed with his judgments.

We have a vice president of engineering. He has a very strong voice in determining what we build. If he agrees, then no one disagrees. So if I want something built in the product, I will go and talk to him, say, 'look, I think this is really important, do you agree?' And if he does agree, then I don't have to worry too much, I just go to the rest of the team, say, 'our VP says this is what we should do, so let's do it', and everyone will agree. (Designer 1)

Designer 3 in Case B said he translated his design judgments/decisions into something that other stakeholders were interested in or cared about. He argued that people from different disciplines had different concerns about the same project. For example, he said designers focused on user experience of a system but developers always paid attention to the efficiency of the system.

What I did was I translated those expectations into languages and things that other people would understand. ... For developers, their area interests would not be the same as mine. Their ultimate goal was how to create a system that didn't fail often. So I would translate them into what they could do, like 'how can we create a system that can work without rebooting for many days? How can it work so that a message sent from a phone by health worker reaches without fail to the health officer?' (Designer 3)

In addition, Designer 5 in Case C chose convincing reasons to explain his design judgments.

I don't think I talked about my prototyping experience with my grandfather with the other designers. ... I talked about the motive of doing prototypes for the project with them. (Designer 5)

DISCUSSION

The findings of this study describe how interaction designers applied their personal experiences to their design work in the context of three interaction design projects. Such findings supplement the existing research on designers' personal experiences that have been described in the related work section. In the following section, we discuss some of the implications of the case study results for interaction design.

The Need to Recognize the Legitimacy of Using Designers' Personal Experiences in Design Practice

Using designers' personal experiences in interaction design practice goes against the rational and objective approaches advocated by HCI community [7,10,23]. However, the resulting patterns uncovered in this study indicate there is a need to explicitly recognize the legitimacy of using designers' personal experiences in interaction design practice. There are several reasons for this argument.

First, the *high-level design pattern* shows designers felt confident enough to incorporate their personal experiences into their design work when they were performing high-level design jobs. For example, designer 1 translated his day-to-day experiences of collaborative work into the system's 'hygiene features'; Designer 3, inspired by his experience of both trust and distrust, recognized that constructing trust relationships among disease surveillance stakeholders should be addressed by their system; and, informed by his childhood DIY experiences, Designer 5 advocated for taking advantage of prototyping to explore different design ideas for their project. However, the *communication pattern* indicates these designers preferred not to share their personal experiences with their team members, but to communicate the design decisions made on the basis of such personal experiences. Also, they justified their decisions by relating other formal or convincing reasons, such as Designer 1 chose to transmit his superior's order; and Designer 3 transformed his judgment into what developers were interested in. Hence, judging by the ways that designers used to communicate how personal experience affected their design work, we can see there was a conflict between designers' recognition of the potency of

their personal experiences in their design work and the indirect way in which they communicated their personal experiences. This conflict implies that at present designers are worried about the lack of persuasiveness of using their personal experiences in interaction design practice. One potential reason may be the prevailing perception of HCI and professional interaction design as rationalist practices.

In addition, the *detailed-level design pattern* shows that designers working with their personal experiences was a spontaneous and intuitive action when they were doing detailed-level design work. Schön describes such kind of action as "knowing-in-action" [22] and also argues "the workday life of the professional work depends on tacit knowing-in-action" [22]. Thus, in this respect, designers using their personal experiences in their job is inevitable. Certainly we should acknowledge the quality of the design work resulting from such kind of intuitive action is developed by and reliant upon the accumulated experiences from years of design practice.

However, explicit acknowledgement of the legitimacy of using designers' personal experiences in interaction design practice is necessary. Some people may think this will come at the expense of user needs or user interest. Therefore, further research is needed to provide designers with suggestions about the circumstances under which their personal experiences could be a useful and complementary design resource.

Implications for Practicing Interaction Design Team

The *authority and opportunity pattern* when applied to an interaction design project shows that the designers' degree of authority in making design decisions is relevant to the chances they have to apply their personal experiences to their design work. In particular, higher-ranking designers (e.g., design lead) had more opportunities to use their personal experiences than the lower-ranking designers (e.g., interaction designer or visual designer). This finding is instructive and has different meanings for different stakeholders involved in a design team. In this section, we particularly discuss the meanings for a project manager, a lead designer, and a designer. In order to easily discuss and present the meanings, we presume a design team adopts either a vertical organizational structure[7] or a horizontal organizational structure[8].

On the one hand, if a design team adopts a vertical structure, its project manager should be aware that this team structure would possibly enable the higher-ranking designers to overuse their personal experiences, and limit the contributions of lower-ranking designers' personal experiences to their design project at the same time. One possible way to mitigate such limitation would be to question high-ranking designers' design judgments, and provide lower-ranking designers with a comfortable discussion environment in order to encourage them to express their views on the team's design projects in team meetings. Correspondingly, a lead designer should iteratively revisit his design judgments made based on his personal experiences. And, a designer needs to actively use his personal experiences if he think such experiences can contribute to the project, and share such experiences with the lead designer and other team members in time.

On the other hand, if the team employs a horizontal structure, this will empower every designer to embed his personal experiences in the design process when needed. In this situation, the manager can consciously encourage communication among team members, because the communication will allow designers to see other people's views on their design decisions made based on their personal experiences, and these views could complement or validate such design decisions. Both the lead designer and the designer can actively share and discuss their design decisions and the personal experiences used to support projects.

CONCLUSION

In order to uncover interaction design practice relevant to designers' personal experiences, this paper undertook a descriptive and multiple case studies approach to explore how interaction designers worked with their personal experiences in three industrial interaction design projects. In each case, the design work of two interaction designers was studied by collecting and analyzing evidence from multiple data sources. The findings of the three case studies illustrated that designers applied diverse personal experiences to different aspects of interaction design practice. Although many researchers and designers may not be surprised by such findings, we still think this study opens up opportunities for further research on designers' personal experiences. For example, it would be worthwhile to compare and contrast interaction designers' opinions and practices regarding using their personal experiences from both academic and industrial settings. This would allow for a deeper and more comprehensive view of how designers' personal experiences can serve interactive technology design effectively, and thus providing designers with appropriate guidelines for more productively incorporating their personal experiences in design practice. We also cling to the expectation that this study can encourage designers who have used their personal experiences in their design projects to report and share their work. But we contend

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[7] "The vertical organization has a structure with power emanating from the top down. There's a well-defined chain of command with a vertical organization, and the person at the top of the organizational chart has the most power" [17].

[8] "Horizontal organizational structure is a form of managing workers in which decision-making is spread among workers along horizontal lines" [8].

there is a need to explicitly recognize the legitimacy of using and better support of the use of designers' personal experiences in interaction design practice first.

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