

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

by

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Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts

in the

School of Interactive Arts and Technology
Faculty of Communication, Art and Technology

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SIMON FRASER UNIVERSITY

Summer 2013

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Abstract

Using designers' personal experiences in interaction design practice is usually considered as a questionable approach by rationalist in HCI. 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 into design practice and also benefited from such experiences. This thesis 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 designers' personal experiences in interaction design practice. In this study, a designer's personal experiences refer to the collections of his/her individual experiences that derived from his/her direct observation or participation in 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.

Keywords: Interaction design practice; designers' personal experiences

Acknowledgements

I owe sincere thankfulness to Professor Ron Wakkary who made me believe in myself, and guided and inspired me throughout this research. I am sure that this thesis would not have been possible without his support, understanding and encouragement.

Secondly, I am heartily thankful to Professor Carman Neustaedter, for his time and patience in helping me with data analysis, and his understanding, support and editing while I was writing the thesis.

Thirdly, I wish to thank the six designers who participated in my study, for their time and valuable ideas about the research questions.

Fourthly, I would like to show my gratitude to my family and friends for their moral support.

Lastly, I would like to thank NCE-GRAND for providing me with financial support. And I would also like to thank the School of Interactive Arts and Technology at Simon Fraser University. The School's support, and the multidisciplinary environment, have expanded my vision of interactive technologies, and allowed for the possibility of many interesting exchanges of ideas and knowledge.

Table of Contents

Approval	ii
Partial Copyright Licence	iii
Abstract	iv
Acknowledgements	v
Table of Contents	vi
List of Tables	ix
List of Figures	ix
1. Introduction	1
1.1. Purpose of Study	2
1.2. Definition of Terms	3
1.3. Methodology	3
1.4. Thesis Structure	5
2. Literature Review	6
2.1. Experience	6
2.1.1. Pragmatic Approaches to Understand Human Experience in Design Research	7
2.1.2. Existing Research related to Designers' Experiences	10
2.1.3. Discussion	12
2.2. Other Relevant Design Research on Designers	12
2.2.1. Design Thinking	13
2.2.1.1. Describing What Design is	13
2.2.1.2. Exploring What Designers Do and How They Think	14
2.2.1.3. Design Thinking as an Interdisciplinary Strategy	16
2.2.1.4. Discussion	16
2.2.2. Design Tools	17
2.2.2.1. Discussion	19
2.3. Practice-based Research	19
2.4. Empathy	20
2.5. Summary	22
3. Research Methodology and Research Design	23
3.1. Restatement of Research Questions	23
3.2. Justification for Qualitative Research Methodology	23
3.3. Rationale for Adopting a Multiple and Descriptive Case Study Approach	25
3.3.1. Five Qualitative Approaches	25
3.3.2. Case Study Research Method	25
3.3.3. Case Study Types	26

3.4.	Cases and Unit of Analysis	27
3.4.1.	Selection of Cases and Subunits of Analysis	28
3.4.2.	Introduction of Cases and Subunits of Analysis	29
3.4.2.1.	Case A	29
3.4.2.2.	Case B	31
3.4.2.3.	Case C	33
3.4.2.4.	Discussion	34
3.5.	Summary	35
4.	Data Collection and Analysis	36
4.1.	Sources of Data	36
4.2.	Preparing Data Collection	37
4.2.1.	Case Study Protocol	37
4.2.2.	Pilot Study	38
4.2.3.	Case Selection	39
4.3.	Field Procedures	40
4.3.1.	Email Questionnaire	40
4.3.2.	In-depth Interviews	41
4.3.3.	Follow-up Interview or Email	42
4.4.	Data Analysis	43
4.4.1.	Establishing A Database	43
4.4.2.	Categorizing Analysis	43
4.4.3.	Comparing Analysis	44
4.5.	Reliability and Validity	49
4.6.	Summary	50
5.	Case Study Analyses	52
5.1.	Subunit Analyses	53
5.1.1.	Using Contemporary Products Pattern	53
5.1.2.	High-level Design Pattern	57
5.1.3.	Detailed-level Design Pattern	62
5.1.4.	Authority and Opportunity Pattern	63
5.1.5.	Responsibility Pattern	65
5.1.6.	Communication Pattern	67
5.2.	Case Level Analyses	70
5.3.	Summary	72
6.	Discussion	75
6.1.	Summarization of the Contribution of Designers' Personal Experiences to Interaction Design Practice	75
6.2.	The Need to Explicitly Recognize the Legitimacy of Using Designers' Personal Experiences in Interaction Design Practice	76

6.3. Implications for Interaction Design	78
6.3.1. Design Management	78
6.3.2. User-centered Design	79
6.3.3. Design Education	80
6.4. Limitations of the Study.....	81
6.5. Summary.....	82
7. Conclusion.....	84
7.1. Revisiting Research Questions	85
7.2. Contributions of the Study.....	87
7.3. Future Work	88
References.....	89
Appendices.....	95
Appendix A. An Example of In-depth Interview Transcript	96
Appendix B. CD-ROM Data	108

List of Tables

Table 1.	Comparison of the Five Qualitative Research Approach	26
Table 2.	Comparison of the Three Cases	35
Table 3.	Themes for Categories.....	44
Table 4.	Background Information of Participants	46
Table 5.	Subunit Level Analysis - Corroboration of Usage Practice.....	47
Table 6.	Subunit Level Analysis	48
Table 7.	Case Level Analysis	49
Table 8.	An Overview of Generated Patterns.....	52
Table 9.	Subunit Level Analysis – Usage Practice and Designers’ Perception.....	55
Table 10.	Subunit Analysis – Usage Practice and the Role of Designers’ Personal Experiences in Interaction Design Practice	66
Table 11.	Subunit Analysis – Usage Practice and How Designers Communicated Their Personal Experiences to Their Design Team members	68
Table 12.	Case Level Analysis	71
Table 13.	Patterns and Research Questions	73
Table 14.	Summarization of the Contribution of Designers’ Personal Experiences to Interaction Design Practice Uncovered by Existing Research and This Study.....	76

List of Figures

Figure 1.	An Example of Coding by Using Saturate	45
Figure 2.	System Screenshot of the System of Case B	60
Figure 3.	A Prototype Created by Designer 6 in the Design Process of Case C.....	64

1. Introduction

Our surroundings are flooded by digital technologies. They appear in almost all of our professional and everyday activities, from work to play, from learning to entertainment. They are breaking the limitation of conventional computer use enabled by a desktop, graphical user interface, mouse and keyboard. New ways of flexible and portable human computer interaction have been introduced. Now we can carry them in pockets, wear them (wearable computing), or even control them with non-digital objects (tangible technology).

In fact, such technologies have extended the scope of the work of interaction designers. Initially, the focus of developing interactive technologies was mainly on usability issues, but because such technologies became more common in our everyday life, interaction designers started to follow user-centered design (UCD) principles to ensure the new designs not only meet people's needs and expectations, but also can be easily used by people with non-technical knowledge. UCD has helped designers to make a number of successful interactive technologies and systems.

But as designers seek to integrate technologies into people's everyday experiences, in the last decade much research in interaction design has focused on user experience (UX) and its related design approaches and design methods. For instance, Forlizzi and Ford (2000) propose three states of user experience including "experience, an experience, and experience as story" (p. 419). McCarthy and Wright (2004) consider "technology as aesthetic experience" (p. 77) and identify four threads of experience: the sensual thread, the emotional thread, the compositional thread, and the spatio-temporal thread. Alongside traditional design methods such as personae (Cooper, 1999), and cultural probes (Gaver et al., 1999), novel ones, such as emotional probes (Lang, 1995), have been proposed in order to allow designers to get closer to their users, and thus designing technologies with engaging user experience.

However, in order to design for rich user experience, designers also need to distil

in their own personal experiences and emotions. A lot of research has demonstrated designers' emotions "play a significant role in creativity problem solving" (Sas & Zhang, 2010, p. 138). But little work has been carried out to investigate how designers' personal experiences can contribute to technology design. In fact, "the rationalist legacy of traditional HCI does not recognize the validity" (Fantauzzacoffin, 2011, p. 3) of using designers' personal experiences in design. However, some researchers have argued designers did incorporate their personal experiences in their design work (Fantauzzacoffin, 2011; Sengers, 2006). And designers in industry have produced products based on their personal experience. For example.

Naoto Fukasawa's cellphone design 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" (Fukasawa, 2007, p. 69). 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. (Zhang et al., 2012, p. 524)

Therefore, I argue there is a need to understand how interaction designers work with their personal experiences in interactive technology design, thus guiding the development of tools to support those practices.

1.1. Purpose of Study

The aim of this thesis is to develop an in-depth understanding and description of current interaction design practices relevant to interaction designers' personal experiences, and thus call for the need to explicitly recognize the legitimacy of using designers' personal experiences in interaction design practice.

Two research questions will be examined:

- How are interaction designers' personal experiences incorporated into interaction design practice?
- What is the role of interaction designers' personal experiences in interaction design practice?

1.2. Definition of Terms

In this thesis, interaction design practice refers to “professional design activities intended to create commercial products” (Goodman et al., 2011, p. 1062). A designer's personal experiences refer to the collections of his/her individual experiences that derived from his/her direct observation or participation in 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 study, 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.

1.3. Methodology

This thesis takes a qualitative approach to examine the aforementioned two research questions, because qualitative research looks at a social and cultural phenomenon in its real-life context, and provides a rich and holistic description of the phenomena (Creswell, 2007). The qualitative method used in this thesis takes the form of a multiple descriptive case study, as it is useful in exploring and describing a phenomenon in depth (Yin, 2009).

A multiple-case approach was selected instead of a single case in order to better understand the phenomenon in question and to gain more reliable findings. According to

a replication logic, three cases were selected from three different enterprises, which are well known as software market leaders. The cases are listed as follows:

- A project aiming to design a collaborative working tool for a multiple business domain, which is carrying out by a large multinational software company,
- A project aiming to design a mobile-based system to track spread of malaria in rural area of India, which was conducted by a research center of a large globe telecommunication, internet, and software company,
- A project conducted by a large international software company aiming to design an add-on for a web browser, which can allow people to share links in a fast, easy and fun way.

Within each case, the design leader of the project and an interaction designer who was highly involved in the design of the systems were interviewed using a semi-structured protocol to gather information on their design practices that were relevant to their personal experiences. Also, other types of evidences, including project progress reports, information on internal project websites, conference papers, project presentation slides, online articles relevant to the projects, prototypes, system screenshots, and system demos, were also collected.

Following data collection, interviews were transcribed. A formal database for this study was also built. After that, text data (e.g., interview transcripts, project progress reports, and conference papers) were “fractured” (Strauss, as cited in Maxwell, 2005, p. 96), and rearranged into different categories based on nine 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, I reread the categorized data repeatedly. After finishing these tables, I 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, 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.

1.4. Thesis Structure

This thesis has been divided into seven chapters. The second chapter provides relevant design research to this study, including experience, design thinking, design tools, practice-based research and empathy, aiming to present motivations for carrying out this study.

Chapter 3 describes the methodological approach adopted in this study, and the research design guided by such methodology. It also presents a description of the three cases that were selected for this study.

Chapter 4 presents the detailed procedures of collecting data and data analysis.

Chapter 5 answers research questions by presenting findings generated by data analysis.

Chapter 6 summarizes the role of designers' personal experiences in interaction design practice and calls for the need to explicitly recognize the legitimacy of using designers' personal experiences in interaction design practice. Also, implications of case study results for interaction design practice are presented. In addition, the limitations of this study are also described in this chapter.

Chapter 7 draws the conclusions of the research, revisits the two research questions, explains contributions of this study, and provides suggestions for future research.

2. Literature Review

In order to give a definition of designers' personal experiences and illustrate motivations for carrying out this study, this chapter describes and discusses relevant research in design disciplines. The literature focuses on five areas: experience, design thinking, design tools, practice-based research and empathy. For each area, I first describe the work involved and then present my discussion.

2.1. Experience

In recent years, the concept of experience has become a buzzword in design disciplines, and experience-related research has greatly increased. This research covers a broad range: from building theories, models or frameworks to help understand human experience (which aims to conceptually develop what user experience is) to proposing methods or techniques for experience-centered design. In this section, I mainly review two aspects of the research including current approaches to understanding human experience and studies relevant to designers' experiences.

Forlizzi and Battarbee (2004) group approaches (which are developed in diverse disciplines, such as "design, business, philosophy, anthropology, cognitive science, and social science" (p. 262)) to understand human experience into three categories:

- *Product-centred models* that provide stakeholders involved in a product design with a checklist including different topics or criteria, which describe the sorts of experiences and issues that must be taken into consideration during the product design process, aiming to help such stakeholders design or evaluate that product (Forlizzi & Battarbee, 2004).
- *User-centred models* that focus on offering methods adapted from different disciplines to help designers and developers to understand the people they are designing for (Forlizzi & Battarbee, 2004).

- *Interaction-centred models* that “explore the role that products serve in bridging the gap between designer and user” (Forlizzi & Battarbee, 2004, p. 262).

Among the three groups, the approaches in the last group are developed based on John Dewey’s pragmatic philosophy of experience (which takes a holistic view of experience)¹, and are more theoretical ways to understand “how experience is formed, adapted and communicated in social contexts” (Karapanos et al., 2009, p. 730). They provide a basis for defining designers’ personal experiences of this thesis. Thus, I will present such models in detail in the following part.

2.1.1. Pragmatic Approaches to Understand Human Experience in Design Research

In a paper by Forlizzi and Ford (2000) three states of human experience are proposed: “experience, an experience, and experience as story” (p. 419).

The authors define *experience* (on the basis of Richard Carlson’s theory of consciousness in *Experienced Cognition, 1997*) as “the constant stream that happens during moments of consciousness” (p. 419), and make a distinction between *experience* and *an experience*. They assume *an experience* (inspired by John Dewey’s theory of experience in *Arts as Experience, 1934*) is made up of a number of experiences and has two distinct features: 1) *an experience* has a beginning and an end; 2) *an experience* often inspires emotional and behavioral changes in the experiencer, and sometimes modifies “the context of the experience as a result” (p. 420). The authors also point out the nature of *experience as story* is communicative (based on Roger Schank’s discussion of ‘experience as story’ in *Tell Me A Story: Narrative and Intelligence, 1990*).

¹ Dewey wrote that experience “includes what men do and suffer, what they strive for, love, believe and endure, and also how men act and are acted upon, the ways in which they do and suffer, desire and enjoy, see, believe, imagine – in short, processes of experiencing....It is ‘double-barrelled’ in that it recognizes in its primary integrity no division between art and material, subject and object, but contains them both in an unanalyzed totality” (Dewey, 1929a, pp. 10-11).

This is because “stories are the vehicles that we use to condense and remember experiences, and to communicate them in a variety of situations to certain audiences” (p. 420).

Moreover, in order to create a systematic account of experience in the context of user-product interaction for designers, the authors break experience apart and employ “sub-consciousness, cognition, narrative and storytelling” (p. 421) to describe it. In their terminology,

- *Sub-consciousness* represents experiences that occur when users “thoughtlessly” (p. 421) perform a routine or interact with familiar products.
- *Cognition* represents experiences that appear when users need to pay attention to their tasks or think about how to utilize an unused product.
- *Narrative* represents experiences that “have been formalized in users’ head” (p. 422).
- *Storytelling* represents experiences that users recount as unique and subjective life stories or “stories of product use” (p. 422).

Furthermore, the authors argue that when a user interacts with a product, his/her experiences dynamically shift between *sub-consciousness, cognition, narrative and storytelling*, and such shifts also move the user between the states of *experience, an experience, and experience as story*. For example,

Shifts from sub-conscious or narrative to cognitive experiences move the user from the state of *experience*, or the maintenance of a particular type of *experience*, to having an *experience*, where the user or context of the *experience* is changed in some way at the result.

Shifts from sub-conscious or narrative experiences to *storytelling* experiences illustrate the human need to communicate, and to share *experience as story*. (p. 422)

In contrast with Forlizzi and Ford’s approach to understand experience, McCarthy and Wright (2004) “take full advantage of the pragmatist approach to aesthetic experience” (p. 77) to “clarify aspects of experience in the context of people’s changing relationships with technology” (p. 53). They see “technology as aesthetic experience” (p. 77), highlight “the sensory and emotional intimacy of relationships” (p. 77) between people and technology, and identify four threads of experience:

- *The sensual thread.* “The sensual thread of experience is concerned with our sensory engagement with a situation, which orients us to the concrete, palpable, and visceral character of experience” (p. 80).
- *The emotional thread.* “The emotional thread refers to value judgments that ascribe to other people and things importance with respect to our needs and desires. Our frustration, anger, joy, and satisfaction acknowledge our need for others in our struggle to achieve emotional unity” (p. 84).
- *The compositional thread.* “The compositional thread is concerned with relationships between parts and the whole of an experience....In an unfolding interaction involving self and other, in a novel, play, or technologically mediated communication, it refers to the narrative structure, action possibility, plausibility, consequences, and explanations of actions” (p. 87).
- *The spatio-temporal thread.* “All experience has a spatio-temporal component....Space and time pervade our language of experience. We talk of needing space to settle an emotional conflict, and of giving people time....In our construction of the spatio-temporal aspect of an experience, we may distinguish between public and private space; we may recognize comfort zones and boundaries between self and other, or between present and future. Such constructions affect experiential outcomes such as willingness to linger or to revisit places or our willingness to engage in exchange of information, services, or goods” (p. 91).

In addition, the four threads are considered not as “fundamental elements of experience” (p. 79), but “a pragmatic tool for thinking about experience” (p. 103).

In 2005, Battarbee and Koskinen (2005) argued the aforementioned two approaches to understand human experience were “implicit individualistic” (p. 6) and missed a vital aspect of human experience. They stated, “People as individuals depend on others for all that makes them truly human. Experiencing happens in the same social context—therefore, it is necessary to account for this context and its effect on experience” (p. 7). Hence, they used the term ‘co-experience’ to describe types of experiences, which took place in social contexts, and were collectively created by people or shared with others.

From the above-presented studies of experience, we can see human experience is a dynamic, complex and subjective phenomenon depending on the interaction between people and various stimuli, which are interpreted through contextual factors. Yet designers’ personal experiences that this thesis investigated cannot simply be defined either as “an experience” that happened in designers’ lives or as ‘co-experience’ that designers shared with other people. To foreshadow, as the study findings from this

thesis illustrate, personal experiences may go beyond this to include situations such as intuitions from past experience.

In this thesis, a designer's personal experiences refer to the collections of his/her individual experiences that derived from his/her direct observation or participation in 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. Moreover, in this thesis, a designer's personal experiences are distinguished from his/her professional design experiences, which 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.

2.1.2. Existing Research related to Designers' Experiences

There are two main research directions in the existing design research related to designers' experience: the role of designers' emotions in creative problem solving and the utilization of designers' personal experiences in technology design.

The literature on exploring how designers' emotions affect creative problem solving contains most of the research, such as studies conducted by Adaman and Blaney (1995), Carlsson et al. (2000), Clapham (2001), Baas et al. (2008), Ashby et al. (1999), De Dreu et al. (2008), Russ and Kaugars (2001), De Dreu (2006), Bartolic et al. (1999), Gasper (2003) and so on. Sas and Zhang (2010) provide a detailed review of such studies, and also summarize their findings. They conclude "most of the work on positive emotions replicated findings" (p. 139) and such findings suggest positive emotions play a "facilitative role in creative problem solving" (p. 139). They also find the work on negative emotions present

two strands of contradictory findings regarding the impact of such emotions on creativity. One line of research shows that negative emotions promote creative performance, even to a greater extent than do positive emotions. For instance anger seems to produce more creativity than relaxed moods, and comparable levels of creativity to happiness. In contrast, another line of research suggests that negative emotions are detrimental to creative performance. For example, fear was associated

with lower levels of flexibility because of increased cognitive persistence and analytical probing of alternatives, whereas sadness was not found to be related to creativity. (p. 139)

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

Fantauzzacoffin (2011) presents a conceptualization process of a design of an infant soothing and 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 "to theorize and validate the relationship between design and experience" (p. 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" (Smith, as cited in Ajjawi & Higgs, 2007, p. 616). Fantauzzacoffin says "the purpose of this presentation is to instigate by giving an example of valid knowledge from processes that defy validation in the rationalist paradigm" (p. 1).

Sengers (2006) 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" (p. 1). The proposition behind this design approach is that "individual, idiosyncratic experience can be a valued contribution to design" (p. 1). 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 (2012) 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" (p. 514). 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 (1996) 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 (2006) 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 (p. 60). In this work, the designer’s personal experience refers to both the author’s own and his family members’ experience using Video Window.

2.1.3. Discussion

Although research on designers’ personal experiences is limited and designers’ personal experiences mean different things to the researchers, the work reviewed above illustrates:

- Designers’ experiences can contribute to technology design.
- Experts in interaction design and HCI do utilize them in their own design or research.
- Researchers in interaction design and HCI have begun their endeavor to bring the black-boxed and hidden aspect of interaction design practice to light.

Thus, as a member of the community of interaction design, I 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.

2.2. Other Relevant Design Research on Designers

Design is a complicated work. It often happens in the situations in which infinite “sources of information, requirements, demands” (Stolterman, 2008, p. 57) and limited “time and resources, knowledge and skill” (ibid, p. 55) intertwine together. Designers

need to handle such complex situations and balance various aspects of design, such as “attractiveness, sensuality, aesthetics, functionality” (Valade-Amland, 2011, p. 17) 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, as well as developing techniques or tools to support the perceived cognition underlying creative activities. In the following sections, I will first show the trajectory of design research on design thinking, and then present some of the research on design tools, which focuses on investigating how practicing designers use, understand and interact with their tools.

2.2.1. Design Thinking

Since the 1960s, research on design thinking has been carried out by scholars from different disciplines, such as engineering, architecture, product design, cognitive psychology and so on. Based on the focus of such studies, they can be broadly classified into three categories: describing what design is, “exploring what designers do and how they think” (Kimbell, 2009, p.3), and considering design thinking as an interdisciplinary strategy. The work of key contributors in each category is presented below.

2.2.1.1. Describing What Design is

The earliest research related to the notion of design can be traced in Herbert Simon and Christopher Alexander’s work. In his book *The Sciences of the Artificial*, Simon (1969) distinguishes design from natural science. He argues design is about “how things ought to be” (Simon, 1996, p. 114) while natural science is about “how things are” (ibid, p. 114). In addition, he considers everyone “who devises courses of action aimed at changing existing situations into preferred ones” (p. 4) as a designer. As a result, this definition (of ‘designer’) leads to his view of design as the kernel of such professional activities as in the domains of engineering, medicine, business, and architecture.

Alexander, in his *Notes on the Synthesis of Form*, argues that “the ultimate object of design is form” (Alexander, 1971, p. 15), and assumes “every design problem begins with an effort to achieve fitness between two entities: the form in question and its context” (ibid). Thus, according to Alexander, form and context are indispensable parts

of design, and the appropriateness of the form depends on the degree of fitness between its context and itself.

2.2.1.2. Exploring What Designers Do and How They Think

Based on Simon and Alexander's discussion of design, a stream of research on design thinking was carried out afterwards.

Nigel Cross (1982) proposes design should be considered as a 'third area' of education (that had been outlined by Archer in *Design in General Education*, 1979), and distinguishes it from the other "two already-established areas" (p. 221) – sciences and humanities – in terms of "the phenomenon of study" (ibid), the appropriate training methods, and "the belief systems and values of the 'culture'" (ibid). Most importantly, he argues "there are designerly ways of knowing" (p. 223), which are featured by five aspects including:

- Designers tackle 'ill-defined' problems.
 - Their mode of problem solving is 'solution-focused'.
 - Their mode of thinking is 'constructive'.
 - They use 'codes' to translate abstract requirements into concrete objects.
 - They use these codes to both 'read' and 'write' in 'object languages'.
- (Cross, 1982, p. 226)

In *The Reflective Practitioner: How Professionals Think in Action*, Donald Schön (1983) proposes an important concept, "reflection-in-action" (p. 49), which both describes the process of how practitioners (such as "architects, psychotherapists, engineers, planners, and managers" (p. viii)) deal with "the troublesome 'divergent' situations of practice" (p. 62) and also demonstrates the ability of practitioners to "think about doing something while doing it" (p. 54). More specifically, when a practitioner reflects in his action, he examines and analyzes the current situation he encounters, "criticizes his initial understanding" (p. 63) of the situation and "constructs a new description of it" (p. 63), and then "tests the new description by an on-the-spot experiment" (p. 63). The practitioner continuously and iteratively performs such a process until he satisfies with a certain situation of his practice. In addition, in order to support his idea of *reflection-in-action*, Schön presents and analyzes several "vignettes"

(p. viii) from various kinds of practices to exemplify the concept. One of them is an “episode” (p. viii) in which an instructor, who is a master architectural designer, “reviews the work of one of his students” (p. 79) in a design studio. Based upon this example, Schön in particular describes “design as a reflective conversation with the situation” (p. 76), “in which designers interact with their intermediate design representations (Gero & Kannengiesser, 2008, p. 77)

In 2001, Dorst and Cross (2001) conducted “a set of ‘think-aloud’ protocol studies of nine experienced industrial designers” (p. 425) to look at how creative activities occur in the design process of a pre-devised design task in a laboratory setting. The analysis of protocols showed that

creative design involved a period of exploration in which problem and solution spaces are evolving and are unstable until (temporarily) fixed by an emergent bridge which identifies a problem-solution pairing. A creative event occurs as the moment of insight at which a problem-solution pair is framed. (p. 435)

Therefore, Dorst and Cross concluded that their studies confirmed “the general validity” (p. 425) of a design model proposed by Maher et al. (1996), which describes “creative design as the co-evolution of problem/solution spaces” (Dorst & Cross, 2001, p. 425).

Different from the aforementioned researchers’ work, Bryan Lawson, on the one hand, concentrates on investigating the various aspects of design process and tries to demystify how designers think (Lawson, 1980). And on the other hand, he focuses on exploring significant factors in developing design expertise (Lawson, 2004; Lawson & Dorst, 2009). For example, in one of his studies, based on a comparison between data from empirical studies of novice designers “on the perception of drawings” (Lawson, 2004, p. 443) and data from interviews with expert designers, he identified five stages that a novice designer “must pass through” (p. 456) to acquire high level design thinking, and he concluded the development process of becoming an expert as:

They need to have studied a substantial body of precedent in order to have developed schemata that enable them to recognize underlying structures in design situations that allow them to employ and adapt gambits. (p. 457)

2.2.1.3. Design Thinking as an Interdisciplinary Strategy

In the last decade, design thinking has emerged as an interdisciplinary strategy. It is considered as the rapidest approach to achieve innovation and commercial success for companies. For example, in *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, Tim Brown (CEO of the design consultancy IDEO) considers design thinking as

[a]n approach to innovation that is powerful, effective, and broadly accessible, that can be integrated into all aspects of business and society, and that individuals and teams can use to generate breakthrough ideas that are implemented and that therefore have an impact.

(Brown, 2009, p. 3)

And In *The Design of Business: Why Design Thinking is The Next Competitive Advantage*, Martin (2009) defines design thinking as “the form of thought” (p. 6) that “balance[s] analytical mastery and intuitive originality in a dynamic interplay” (p. 6), and argues “the firms that master it will gain a nearly inexhaustible, long-term business advantage” (p. 6).

2.2.1.4. Discussion

From what have been discussed above, we can see that design thinking is a complex research topic, and there have already been a number of valuable studies. But these studies still have some limitations.

First, most of them adopt a theoretical way to talk about design thinking, rather than taking a perspective of describing how design thinking actually happens in design practice. Second, the ones that present empirical studies tend to examine individual designers' work, yet professional design practice is typically carried out in groups, and group collaboration and conversation would influence the design thinking process. Moreover, the design tasks assigned in such empirical studies “often reflect simplified and reduced conditions” (Liikkanen et al., 2011, p. 309), rather than the type of complex situations designers encounter in their profession. Thus, the theory built by these studies may not adequately inform real-life design practice, like the reality in design companies. In fact, some researchers have made similar arguments. For example, Jung et al. (2010) propose that existing theories of design “have not allowed a sustained discourse among

the broader community of design researchers let alone between design researches and design practitioners” (p. 234).

Unquestionably, the limitations of these studies are understandable because “the world of design practice is presumably heterogeneous, secretive, and poorly documented, rendering it a difficult catch for rigorous research” (Liikkanen et al., 2011, p. 309). However, we could endeavor to study and develop understanding of real-life creative practices.

2.2.2. Design Tools

During the course of an interaction design project, designers employ multiple “methods, tools, techniques, and approaches - from here on generically called *tools* -” (Stolterman et al., 2008, p. 1) to help them progress the design process and improve “the quality of design outcome” (Stolterman et al., 2008, p. 1). These tools include pen and paper, sketches, brainstorming techniques, contextual inquiry, physical prototypes and so on.

In *Thoughtful Interaction Design*, Löwgren and Stolterman (2004) categorize design tools used in interaction design under five headings: inquiry, exploration, composition, assessment, and coordination. They define each category as follows:

Inquiry corresponds to the aspects of design work that are mainly oriented toward finding out about a design situation, both in terms of what the situation is currently like and what it could be like in a possible future. *Exploration* is a general label for the work involved in moving through the spaces of possible solutions and problem formulations. *Composition* refers to the methods and techniques involved in crossing the gap from a more general vision to an increasingly specific operative image. *Assessment* is the critical examination of a design idea, concept, specification, prototype, or artifact. *Coordination* is the meta-level of our structure: involving methods and techniques intended to facilitate the design process, particularly the coordination between multiple participants in the process. (p. 65)

Clearly, a significant portion of the research in design disciplines is about design tools. Some of this research focuses on investigating the roles a particular but popular design tool (e.g., sketching, mood board) plays in the job of an individual designer or in the

collaboration of a design team, such as in Van der Lugt (2005) and Lucero's (2012) work. Some researchers focus on describing a new and task-specific tool and providing case studies of its use, like in Forlizzi & DiSalvo (2009), and Lee et al.'s (2010) work. In this thesis, I focus especially on the ones that study design tools by examining and understanding interaction design practice. The mutual purpose of such research is to outline the implications of its findings for the further development of tools intended to support "design activity in a way that is appreciated by practicing designers" (Stolterman et al., 2008, p. 1).

For example, Rosson et al. (1988) interviewed (via phone) 22 experienced practitioners (including programmers, software developers, technical staff, researchers and university professors) from various successful projects (including "17 projects completed within IBM and five from other organizations" (p. 1289)) to identify main tasks such practitioners performed in user interface design practice. The patterns that emerged in the study led to a list of interesting suppositions about tools that might facilitate the process of developing user interfaces. Also, based on the observation of the variety among the principles that the practitioners viewed as most important to their design of user interfaces, the authors concluded that they "should not be attempting to build one best design tool, but rather developing an array of tools appropriate to different design contexts" (p. 1297).

Newman and Landay (2000) undertook a study with 11 professional designers (who were working in industry) through interviews and observations of design tools such designers utilized in their web site design practice. The study aimed to discover "issues that would guide the design of informal tools² for supporting web site design" (p. 263). The results from the study suggested that "web site design tools intended to support the early phases of the design process should employ informal interaction techniques, should support multiple site representations, and should integrate well with other applications that designers use regularly" (p. 263).

² Newman and Landay define the informal tools as ones that "support natural, ambiguous forms of human-computer interaction" (Newman & Landay, 2000, p. 263).

Stolterman and Pierce (2012) interviewed 11 professional interaction designers to investigate the relationship between such designers and their design tools, in particular “looking at how designers choose and use tools for generating ideas” (p. 25). The findings displayed that the relationship between designers and their tools was very complicated, and “there was no simple way to summarize the reasons and arguments that truly guide a designer’s choice of tools” (p. 28). Criteria such as “efficiency” and “ease of use” initially explained designers’ selection of tools, but the authors also found that designers chose their tools in terms of their personal character and experience (in this work, experience refers to designers’ habits of using designing tools), and the social, material, and cultural context in which the design process took place.

2.2.2.1. Discussion

The studies I have presented above are only a small part of the ever-increasing research on design tools. However, what interests me about them is they all seek to examine interaction design practice and describe what professional practitioners are actually doing in the field. Thus, their research approaches are informative and referable to the study of this thesis.

2.3. 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 (2004) 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” (p. 122). 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. (Rogers, 2004, p. 123)

Stolterman (2008) argues, “science is not the best place to look for approaches and methods on how to approach design complexity” (p. 55) through comparing “the notion of complexity in science and in design” (p. 55). He assumes understanding of the nature of design practice is the basis of any interaction design research aiming at sustaining design practice. Goodman et al. (2011) give an overview of “two decades of publications that suggest a lack of synchronization between HCI research and interaction design practices” (p. 1062), 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” (p.1062). Liikkaneen et al. (2011), 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” (p. 310), and propose that “a practice-based approach for design research” (p. 309) can “yield several insights into professional designers’ productivity” (p. 309), and thus could suggest “design tools for both practitioners and students in the future” (p. 309).

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 my study.

2.4. Empathy

In recent years, designers and researchers in the fields of interaction design and HCI have given much attention to empathy and empathic design. 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 expectation and needs. Thereby, considerable research related to empathy has emerged in design literature, such as studies carried out by Leonard and Rayport (1997), Buchenau and Fulton Suri (2000), Mattelmäki and Battarbee (2002), Wright and McCarthy (2008) and so on.

Kouprie and Visser (2009) 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" (p. 438), some considers empathy "as an ability people have, and differs for individuals" (p. 439) and some focuses on describing a variety of empathic design techniques, such as observation, persona, storyboards, role-playing, body storming, and so on. Based upon the review, Kouprie and Visser (2009) argue that the existing research doesn't clearly explain "what empathy in design is and how it can be achieved" (p. 438). Therefore they examine "the psychological literature" (p. 441) to see how psychologists define empathy.

According to Kouprie and Visser (2009), some researchers in psychology believe empathy "takes place when the boundaries between the empathizer and the empathee disappear" (p. 443), but some advocate "the boundaries should not disappear" (p. 443). 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" (p. 443) the empathee to experience the empathee's feeling, but the latter considers the empathizer only needs to "stay beside" (p. 443) the empathee to understand the empathee's feeling. So the former emphasizes the "affective" (p. 442) aspect of empathy, but the latter highlights the "cognitive" (p. 442) 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" (p. 443); and in "role-playing the designer can *become* the user for a moment" (p. 443).

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" (p. 445).
- *Immersion*. In this phase, the designer "wanders around in the user's world" (p. 445) and obtains his own experiences.
- *Connection*. In this phase, the designer "connects with the user by recalling explicitly upon his own memories and experiences" (p. 445), and "resonates with the user's experience" (p. 445) "in order to reflect and be able to create an understanding" (p. 445) about the user from his own perspective.
- *Detachment*. In this phase, the designer "leaves the user's world" (p. 445), "steps back into the role of designer" (p. 445), and furthermore reflects what he has experienced in the user's world.

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" (p. 446) 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 empathic approach. But the difference between them is that the empathic approach draws upon designers' personal experiences of third persons.

2.5. Summary

This chapter has presented motivations for conducting this study. First, designers' personal experiences have begun to gain attention from some design researchers. And these people have used their design practices as evidence to show the values of designers' experiences. However, much more work is needed to show how interaction designers in industry work with their personal experiences in their design practices, and thus lay out in what design situations designers' personal experiences are useful. Second, existing research on design thinking has been carried out in simplified conditions, which differ from design practices in industry. Thus such research is inadequate to inform real-life practices. Third, a small number of studies on design tools have examined what interaction designers actually do in their design practices. Their research methods are informative for the research of this study. Forth, scholars in the field of interaction design have begun to support practice-based research to produce outcomes that can effectively improve interaction design practice. The researcher of this study was encouraged by this advocacy.

The next chapter will discuss the research methodology this study adopted.

3. Research Methodology and Research Design

This chapter first restates the research questions of this study, then describes the rationale for employing a qualitative case study approach as the research methodology, and finally presents the research design that was guided by the methodology.

3.1. Restatement of Research Questions

There are two research questions that will be addressed in this study:

- How are interaction designers' personal experiences incorporated into interaction design practice?
- What is the role of interaction designers' personal experiences in interaction design practice?

3.2. Justification for Qualitative Research Methodology

There are various ways to classify research methods, and the most common approach is to categorize them as quantitative and qualitative research. Maxwell (2005) argues these two kinds of research have “different strengths and logics, and are often best used to address different kinds of questions and goals” (p. 22).

Quantitative research is “an objective, formal, systematic process in which numerical data are used to quantify or measure phenomena and produce findings” (Carr, 1994, p. 716). In general, quantitative research begins with describing a theory, then generates and develops hypotheses about what should happen in a specific circumstance based on that theory. Next, the collected data are analyzed “using mathematically based methods (in particular statistics)” (Aliaga & Gunderson, as cited in Muijs, 2004, p.1) to see whether the hypotheses are borne out. If they do, the specific data examined provide support for the theory. So quantitative research “describes, tests

and examines cause and effect relationships” (Carr, 1994, p. 716) of a phenomenon “using a deductive process of knowledge attainment” (Carr, 1994, p. 716).

However, qualitative research looks at social and cultural phenomena in real-world settings, and seeks to “make sense of, or interpret, such phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, as cited in Creswell, 2007, p. 36). In other words, it attempts to describe and understand a given research problem or topic from the perspectives of the participants it involves, rather than “values, preconceptions, or meanings held by researchers” (Yin, 2010, p. 8). The ultimate goal of qualitative research is to provide a rich and holistic description of the phenomena studied (Creswell, 2007).

Therefore, based upon the differences between the two types of research, a qualitative research approach was selected for the study of this thesis. There are two main reasons:

First, in this study, I am interested not only in stories and experiences about interaction designers’ use of their personal experiences in interaction design practices, but also in their interpretation and opinions regarding such behaviors. These details can only be obtained by “talking directly” (Creswell, 2007, p. 40) with interaction designers who are working in industry, rather than a pre-coded questionnaire, which quantitative research often employs.

Second, in order to better address the research questions of this study, a comprehensive and detailed understanding about the real-life contexts in which interaction designers’ personal experiences are applied into interaction design practices is also needed.

3.3. Rationale for Adopting a Multiple and Descriptive Case Study Approach

3.3.1. *Five Qualitative Approaches*

Creswell describes five approaches to qualitative inquiry: “narrative research, phenomenology, grounded theory, ethnography and case studies” (Creswell, 2007, p. 53).

These five approaches have different “primary objectives” (Creswell, 2007, p. 77), and are suited for different research design. For example, ethnographic approach is often chosen to study an integral “cultural-sharing group” (ibid, p. 68) in a natural setting in which this group is involved, in order to describe and interpret the group. The goal of phenomenological studies is to understand the lived experience of human beings “through the detailed description of the people being studied” (Jenkins, 2007, p. 38). Different from them, a case study is meant to “investigate a contemporary phenomenon in depth and within its real-life context” (Yin, 2009, p. 18), aiming to develop an in-depth description and analysis of such phenomenon. Table 1 compares the five approaches in terms of their primary objectives (focus), types of problems best suited for design and the unit of analysis.

3.3.2. *Case Study Research Method*

The primary goal of this thesis is to develop an in-depth understanding and description of interaction designers’ manipulation of their personal experiences in real-life interaction design practices and situate such understanding within the particular design contexts of these practices. To attain this objective, a case study approach seems to be the most suitable method among the five qualitative research approaches, as the case study method permits studying both the phenomenon of interest and its context, producing understanding of how the phenomenon is shaped by such unique circumstance (Yin, 2009).

Moreover, a case study approach is preferred when “the investigator has little or no control” (Yin, 2009, p. 13) over events. For this study, there was no control feasible over the real-life interaction design projects. Furthermore, compared with other

qualitative research methods, the case study approach emphasizes investigation of a phenomenon using multiple data sources (Yin, 2009), in order to “ensure that the issue is not explored through one lens, but rather a variety of lenses, which allows for multiple facets of the phenomenon to be revealed and understood” (Baxter & Jack, 2008, p. 544). Therefore, a case study method was selected for this study.

Table 1. Comparison of the Five Qualitative Research Approach

Characteristics	Narrative Research	Phenomenology	Grounded Theory	Ethnography	Case Study
Focus	Exploring the life of an individual	Understanding the essence of the experience	Developing a theory grounded in data from the field	Describing and interpreting a culture-sharing group	Developing an in-depth description and analysis of a case or multiple cases
Type of Problem Best Suited for Design	Needing to tell stories of individual experiences	Needing to describe the essence of a lived phenomenon	Grounding a theory in the view of participants	Describing and interpreting the shared patterns of culture of a group	Providing an in-depth understanding of a case or cases
Unit of Analysis	Studying one or more individuals	Studying several individuals who have shared the experience	Studying a process action, or interaction involving many individuals	Studying a group that shares the same culture	Studying an event, a program, an activity, more than one individual

Note. Adapted from Qualitative Inquiry and Research Design: Choosing among Five Approaches, by J. W. Creswell, Thousand Oaks, CA, USA: Sage Publications. Copyright 2007 by J. W. Creswell. Adapted with permission.

3.3.3. Case Study Types

Yin (2009) proposes three types of case studies: explanatory, descriptive, and exploratory. He argues explanatory case studies are often used when the goal of an inquiry is to “*explain* the presumed causal links in real-life interventions that are too complex for the survey or experimental strategies” (Yin, 2009, p. 19). Descriptive case studies seek to “*describe* an intervention and the real-life context in which it occurred” (ibid, p. 20). And exploratory case studies are “used to *enlighten* those situations in which the intervention being evaluated has no clear, single set of outcomes” (ibid, p. 20). Therefore, in terms of such definitions of the three types of case studies, descriptive

case study seems to best match with the research goal of this study, which aims to create a comprehensive understanding and account of interaction designers' use of their personal experiences in interaction design practices and the settings in which such design activities occurred.

In addition, Yin also distinguishes case study research into “single- and multiple-case studies” (Yin, 2009, p. 19). He argues the single-case design is highly reasonable in five situations “where the case represents (a) a critical test of existing theory, (b) a rare or unique circumstance, or (c) a representative or typical case, or where the case serves a (d) revelatory or (e) longitudinal purpose” (Yin, 2009, p. 52). In this study, neither of the five conditions is applicable, therefore, a multiple-case study design was chosen. Another reason for selecting a multiple-case approach is it allows a lot of evidence to be gathered from various cases and facilitates comparison among such cases, which could enable the results of the overall study to be more reliable (Yin, 2009).

3.4. Cases and Unit of Analysis

Defining the case and unit of analysis of a multiple-case study is a primary and crucial task. Yin (2009) describes two variants of a multiple-case study design. It can be either *holistic* or *embedded* depending on what needs to be examined to address the questions of interest. In other words, a holistic multiple-case study considers each case involved as a whole (from which “no logical subunits can be identified” (Yin, 2009, p. 50)), and draws conclusions only about “the global nature” (ibid) of the cases. In contrast, an embedded multiple-case study investigates a phenomenon from both the cases and their subunit levels, aiming to enrich the understanding of such phenomenon.

As in this study, interaction design practice refers to professional design activities intended to create commercial products, and such design activities are typically conducted in groups. So an embedded multiple-case study was chosen. The cases (larger units of analysis) of the 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).

3.4.1. Selection of Cases and Subunits of Analysis

The selection of cases for this study followed "a 'replication' design" (Yin, 2009, p. 53). A "replication" design means the multiple cases of a study are treated as multiple experiments instead of multiple respondents in a survey. The procedure of selecting multiple respondents in a survey is considered to adopt "a 'sampling' design" (Yin, 2009, p. 54). Yin (2009) points out the rationale of a "sampling" design differs from that of a "replication" design. He says that a "sampling" designs

requires an operational enumeration of the entire universe or pool of potential respondents and then a statistical procedure for selecting a specific subset of respondents to be surveyed. The resulting data from the sample that is actually surveyed are assumed to reflect the entire universe or pool, with inferential statistics used to establish the confidence intervals for which this representation is presumed accurate. The entire procedure is commonly used when an investigation wishes to determine the prevalence of frequency of a particular phenomenon.
(Yin, 2009, pp. 58-59)

However, case studies are usually not used to evaluate the prevalence of a phenomenon, but to describe both a phenomenon and its context in depth.

In addition, Yin (2009) describes two approaches to implementing a "replication" design in the selection of multiple cases for a study. One is called a literal replication, which implies the selected cases are assumed to generate similar results. The other is called a theoretical replication, which indicates the selected cases "predicts contrasting results but for anticipatable reasons" (Yin, 2009, p. 54).

This study adopted a literal replication design. Each case was chosen in terms of the following criteria:

- Investigator 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 Investigator could 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 could 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 system of the project, because these designers may offer more stories about how they use their personal experiences in the project.

The selected cases and subunits of analyses will be introduced in the next section.

3.4.2. Introduction of 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. The procedure for selecting cases and participants will be detailed in section 4.2.3 in chapter 4.

Due to ethical consideration, the real names of these projects and participants were not used in this thesis. The projects were identified as Case A to Case C, and participants were identified as Designer 1 to Designer 6.

3.4.2.1. Case A

Case A is carried out by a subsidiary of an international software company, which is located in Vancouver. The company has more than 100,000 customers and provides a variety of solutions and services for enterprises of varied sizes and industries, aiming to help them stay ahead in the market competition through facilitating efficient collaboration and effective usage of business insight.

The product of Case A is one of the solutions, which includes a bunch of features to help teams make good decisions, especially for people working across different corporate functions and geographies. In addition, the product could track and display a team's decision-making process and thus allow people to see a direct link between their

suggestions and the final result. The product has undergone several version releases, and the project will continue to evolve.

There are about 50 stakeholders involved in the project, including product owners, one user experience team (which consists of 4 interaction designers, 1 visual designer, and 2 UI developers), engineers and a usability testing team.

The project employs an agile development process in which each sprint lasts three months, and after each sprint the company releases a new version of the product. Every sprint starts with an *inception meeting* in which product owners talk about what features need to be built in the sprint. Then interaction designers begin to draw sketches, design wireframes, and develop quick mockups around these features. Every day they join a stand-up meeting with other user experience team members to talk about progress. Also the user experience team has design review meetings in which designers share their work and get feedback from others. After some iterations, the user experience team brings the work to a meeting called an *elaboration* meeting to show the product owners and engineers what the concepts are and how they work. These people might give some feedback on whether the concepts are feasible, or might tweak them so that engineers could actually build them. After construction, engineers deliver the finished system to interaction designers, and designers do quality assurance. If the system works well, it will be released. If not, it will be debugged. During each sprint, the user experience team doesn't do usability testing. This work is always carried out by the usability team after each product release.

At present, the product has been gaining success in the market, but it is viewed as not sufficiently mature by the user experience team as it has many so-called 'hygiene features' that have yet to be addressed. '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.

In this project, Designer 1 has been the design lead of the user experience team for three years. His education background is interaction design, and he has been working as an interaction designer for 12 years. As a design lead in the project, his

responsibility is multifaceted. First, he has to work with his design team members, and help them to solve different design problems they encounter in the design process. Moreover, he needs to look at places where problems exist within the launched version of the product and make enhancements and improvements to fix those problems. In addition, he worked with product owners and participated in decision-making around product features of the launched versions of the product. Furthermore, he works with the usability team to plan and execute usability testing of the product to get a sense of where problems are for the users. Lastly, he also does some design research related to the product, like interviews with product users and customers.

Designer 2 has been working as an interaction designer in this project for three years. His education background is also interaction design and before he joined the project, he had been working in the industry as an interaction designer for four years. As an interaction designer, his job in the project is to design interaction flows and make mid-level fidelity mockups for the design features assigned to him. Sometimes he also does data analysis of the reports generated by their own system to look at who is using what features. The findings help the design team to understand whether they are doing well in a particular feature or not, and then they can make assumptions based on that data.

3.4.2.2. Case B

Case B was conducted in 2009 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 research center is dedicated to exploring technology frontiers and furthering the improvements in the quality of people's lives.

The aim of the project was to design a mobile-based system to track the spread of malaria in rural areas of India. The system allows rural health workers in primary health centers to report data through mobile devices regarding the spread of diseases in their local area. The raw data from the grassroots level is aggregated and analyzed on a central server, and then visualized and accessed by doctors who are working in primary health centers through their mobile phones. The analyzed information is also accessible to district, state, and national level health authorities. Furthermore, in order to make the centralization of the data as fast as possible, the data is uploaded into the system on a daily basis. If a health worker hasn't reported the information within one day, he/she will

get a notification to report the data. Thus the key stakeholders, like doctors in primary health centers, can give rapid responses and take direct actions for preventing or curing the easily spread diseases, thus mitigating the negative impact of the diseases. In addition, in order to ensure the creditability of the system, when health workers report information, they will get a confirmation back immediately. If they think that data is wrong, they will have six hours to correct that data by sending another message, so that the previous data will be overwritten.

The design team of this project included three interaction designers and four developers. They also hired a partner team including four disease surveillance experts from a medical school, because the design of the system needed domain knowledge in medicine as inputs.

The project started from qualitative research, which aimed to explore possibilities of using mobile technology in health care. In terms of their interviews with health authorities, they found the government already had a paper-based disease reporting mechanism. But it was not efficient and always took two to three weeks to report the disease cases. Also, there was always a discrepancy between the real number of cases and the cases reported by the system. So they came up with their primary design goal, which was designing a near real-time mobile system that fitted the existing reporting mechanism and didn't 'mess up' people's work, but could improve the reporting efficiency and raise the accuracy. Then they did a concept design and created an initial system. After that, they applied the system in 22 primary health centers that are located in the malaria prone areas. The whole process took about one year.

Designer 3 was the design lead of the project. His education background is human-computer interaction and he has been working as an interaction designer for about six years. He was involved in the whole process of the project and was responsible for designing the system. He had gone to the villages for four months not only to train health workers in how to use the system but also to experience what health workers experienced in their day-to-day lives in malaria season. Thus, according to the real feedback from health workers and what he observed and experienced, he and the developers gradually refined the system to ensure it was actually meaningful and matched the requirement of users. In fact, there were a lot of modifications made from

the initial design, because the initial design was just to meet the medical needs proposed by doctors in their partner team. The human (e.g., health workers, doctors) needs and practical problems (for example, there was no cell phone connection in certain villages) that they had never considered before, were addressed when they were in the field.

Designer 4, whose education background is human-computer interaction, is a mobile user experience professional with nearly 10 years of experience of working at the company. He set up the project and was the project manager. He was mainly responsible for creating contact with the medical school and health authorities. He was also involved in the concept design stage and gave Designer 3 suggestions.

3.4.2.3. Case C

Case C was carried out in 2010 by the Vancouver office of a large-scale international non-profit software organization. This organization is funded by individual donors and various companies. The organization is dedicated to improving the accessibility of the web for everyone, enabling people to form their own online lives, and building environmentally friendly products.

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, essentially a button embedded in the browser. When people click, it opens up popular social networking sites, like Twitter or Facebook, and then people can send links or emails to others.

There were five people involved in the project team, including a product manager, one user experience designer, two frontend developers who also did some backend pieces of work, and an operations person who handled running the server components.

The design process started from a simple survey to examine how often people share web links. Then they recruited a team of people who aren't computer savvy to learn the detailed procedure of sharing links through a web browser on computers and usability issues occurring in such a procedure. After that, they adopted an agile development process. In each sprint, they mainly employed paper prototyping to develop

and share design ideas, and implemented the ones they satisfied to create digital prototypes by using OmniGraffle or HTML. The project team met every Wednesday to update product status. Once they completed each development cycle of the add-on, they put it onto the usertesting.com site to gather feedback on participants' activity. This was a constant part of the iterations to ensure that they didn't regress user experience as they made changes.

Designer 5 set up the project, and worked as the user experience lead and product manager. His education background is computer science and psychology. He has been practicing as an interaction designer for eight years. Designer 6, who holds a communication design background, was the user experience designer and was responsible for the interaction and visual design of the project. He has been doing interaction designer for three years.

3.4.2.4. Discussion

From the above introduction of the three cases, we can see there are both similarities and differences among them.

First, all three cases come from large software companies, but the type of company differed: the first one is commercial, the second one is focused on research, and the third one is non-profit. Accordingly, the project types of the three cases are diverse as well.

Second, according to the numbers of people involved in each project, their scales are different. Specifically, about 50 people who came from a North American subsidiary joined in the first project. Eleven people who came from a lab located in Asia participated in the second project. And five people who came from an office located in Vancouver conducted the third project. However, there is no big difference between the numbers of interaction designers involved in each project. Table 2 presents the comparison of the three cases.

3.5. Summary

In this chapter, I have shown the main reasons why a qualitative and descriptive case study approach was adopted for this study. These reasons came from the primary goal of the study, which is to develop an in-depth understanding and description about interaction designers' use of their personal experiences in real-life interaction design projects as well as the impacts of the projects' contextual factors on such usage practices. Also, in order to achieve a more reliable research result, a multiple-case study method was employed. The selection of the cases was guided by a literal replication logic. And three interaction design projects from three different software companies were finally chosen. Each of them has been introduced in this chapter as well.

In the next chapter, I will present the different types of data I collected and also describe how I analyzed them to answer the research questions.

Table 2. Comparison of the Three Cases

Case	Company Type	Project Type	Project Team	Project Scale	The number of Interaction Designers Involved in The Team
Case A	A large international software company	A commercial business project	A subsidiary located in Vancouver	About 50 people involved in the project team	Four
Case B	The research center of a large globe telecommunication, Internet, and software company	An exploratory research project	A lab located in Bangalore	Eleven people involved in the project team	Three
Case C	A large-scale international non-profit software organization	An exploratory research project	An office located in Vancouver	Five people involved in the project team	Two

4. Data Collection and Analysis

This chapter first presents the multiple data sources of this study. Then it depicts three steps in preparation for the formal data collection. After that, it describes the detailed field procedures of gathering evidence from various data sources, and also shows how the collected data were analyzed.

4.1. Sources of Data

According to Yin (2009), the most commonly used sources of evidences in doing case studies are “documentation, archival records, interviews, direct observation, participant-observation, and physical artefacts” (p. 98). Although not all six sources are relevant to a particular case study, it is both the major strength and the essence of the case study approach to use multiple sources of evidence. This is because the use of multiple data sources could not only allow a researcher to “address a broader range of historical and behavioral issues” (Yin, 2009, p. 115), but also facilitate “the development of a *converging line of inquiry*” (*ibid*), which is the process of data “triangulation and corroboration” (*ibid*, pp. 115-116) aiming to achieve the construct validity.

For this study, there are four types of data sources:

- Documentation, which takes the forms of project progress reports, information on internal project websites, conference papers, project presentation slides, and online articles relevant to the projects;
- Archival records, which take the forms of photos that designers took and digital prototypes generated during a project design process;
- In-depth Interviews;
- Digital artifacts, which take the forms of systems projects produced, system screenshots, and system demos.

Among them, interviews are viewed as the essential sources of information for this study, because experience is innately personal, and designers’ use of their personal

experience in design practice is an implicit process; it is not easy, possible, and feasible to obtain through other data collection approaches, like observation. But it should be noted that other three types of data sources are also very important, as the interview data need to be corroborated by the information from them.

4.2. Preparing Data Collection

In order to effectively collect data, I completed three tasks before I went to the field. The first one was to develop a case study protocol, the second one was to run a pilot study, and the third one was case selection. Each of them is discussed further in the following sections.

4.2.1. Case Study Protocol

A case study protocol includes instruments, field procedures and general rules that need to be followed during a data collection process. It is considered as one major means of “increasing the reliability of case study research” (Yin, 2009, p. 79). For this study, the protocol I developed includes four parts: (1) expected data sources to help address the research questions; (2) approaches to looking for possible cases and gaining access to the potential participants; (3) procedures of conducting interviews as well as essential interview questions; (4) strategies to help keep the participants away from any potential harm.

The contents of the first part have been presented in section 4.1. The contents of the second and third parts are illustrated in section 4.2.3 and section 4.3. As for the fourth part, there are four specific strategies used in this study, which are as follows:

- First, a research ethics report was reviewed and accepted by the Simon Fraser Research Ethics Board before conducting the research.
- Second, the interaction designers involved in this study and their project managers had all explicitly agreed to participate in the research by signing an informed consent form.
- Third, names of the interaction design projects, interaction designers participating in the study, and their corporations were disguised to maintain confidentiality.

- Fourth, the collected data were treated as confidential information, and were not shared or discussed with anyone who is irrelevant to this study.

So in fact, when I was preparing the case study protocol, I also prepared some documents needed in this study, such as an ethics report, informed consent forms and so on.

4.2.2. Pilot Study

A pilot study was carried out after I completed the development of case study protocol and before I selected the final cases. The aims of running this pilot study were threefold: (1) to refine the orientation of interview questions; (2) to practice my interview skills; (3) to assess if Skype and the field procedures developed in the case study protocol were workable for interviews. Therefore, the cases selected for this pilot study didn't follow "the criteria for selecting the final cases" (Yin, 2009, p. 92), which have been presented in section 3.4.1. Yin says "convenience, access, and geographic proximity can be the main criteria for selecting a pilot case or cases" (Yin, 2009, p. 93). Guided by such criteria, this pilot study included five cases, which were individual designers. One was my labmate, who had worked as an industrial designer in industry for one year. The rest were my friends, who were living in China and working as interaction designers in industry. Although these pilot cases are different from the final cases, which are defined as interaction design projects, I believe it was not an obstacle to achieving the three goals of the pilot study.

While doing the study, I realized I learned several lessons, and some improvements should be made regarding the details of data collection.

First, the definition of designers' personal experiences should be clearer in the document of *in-depth interview guide*³. And more examples should be given to clarify

³ In-depth interview guide is a document that was devised to help designers to understand what I mean by designers' personal experiences. It presents my definitions of two important concepts: designers' personal experiences and designers' professional design experiences. It also includes some examples to help understand such definitions.

what is and what isn't included in the range of designers' personal experiences that I defined for this study. Also, before each interview, I should make sure the participant had read the document and understand the definition.

Second, some of the interview questions were not useful and should not be asked, such as: (1) how do you think your experiences can contribute to the design results of the project? and (2) how do you think your experiences can contribute to your creativity in design practice?. In fact, the answers to these two questions became clear after designers answered the rest of the questions in the interviews.

Third, the basic field procedures⁴ worked well for the interviews. Skype was an effective instrument for long-distance interviews. The designers who conducted the interviews via Skype all used their own computers or laptops. It seemed they felt comfortable to look for materials like photos, pictures or links on their computers/laptops in the interviews, and then send them to me to help understand what they said. Although sometimes the connection was poor, it was easy to overcome.

Fourth, I felt designers' professional design experiences had an impact on the quality of interviews. In this pilot study, the information shared by experienced designers was more interesting and informative than that provided by junior designers.

Concluding, from my perspective, I thought the three goals of this pilot study were achieved. And based on what I learned from it, I revised the initial case study protocol. Also, the stories designers recounted in the study were interesting, which made me curious about what designers would share in the formal case studies.

4.2.3. Case Selection

In order to find cases potentially suitable for this study, I employed two strategies. First I called seven interaction designers that I know and who are now working in

⁴ The basic field procedures include: email questionnaire, in-depth interviews, and follow-up interview or email. They are described in section 4.3.

industry. Each conversation lasted about 15-20 minutes, and my goal was to explain my research purpose and to request an opportunity to study the project he/she was working on. Second I asked my labmates and friends to help me contact the interaction designers they are familiar with to find out if they could participate in the study. After this step, five designers verbally agreed to provide help. Among them, four designers were project leaders.

Then I emailed them the informed consent form, which includes confidentiality agreements, a brief introduction of my research purpose and their responsibilities and rights throughout the study, to show them a clearer picture of this study. In the same email, I asked them to sign the form if they decided to participate in the study, and also asked them to provide me with the email contacts of their co-workers who were also involved in their projects. As for the designer, who is not a project leader, I also sent a 'request permission letter' to his manager via email. Once the designers offered me their team members' contact information, I sent them emails inquiring if they had time and would like to join in my study.

In the end, based on the case selection criteria discussed in section 3.4.1 in chapter 3, three interaction projects were chosen. They have been described in section 3.4.2.

4.3. Field Procedures

In the field, data collection followed the revised case study protocol, and the evidence was collected through three steps: email questionnaire, in-depth interviews, and follow-up interview or email. Each step is described in the following sections.

4.3.1. *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 I could have an overview of their background that helped my preparation of the interviews.

Also, in the same email, I asked for their schedule and availability to do interviews, because they have day jobs, and I had to use their leisure time wisely. Then on the day before the scheduled interviews, I emailed or texted them to remind and confirm our appointments.

4.3.2. *In-depth Interviews*

Interviews were carried out at scheduled time. Some of them were conducted at designers' offices, some were done in a cafe, and some were undertaken via Skype. The means and venues were determined by designers in advance. A semi-structured interview method was adopted, and a series of questions created in the revised 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.

Phase one aimed to explore designers' perceived role of their personal experiences in the studied projects. In this phase designers were asked to talk about their general opinions about applying designers' personal experiences in interaction design practices and their experiences of using their personal experiences in the projects this research studied. For example, questions included:

- Can you briefly introduce the project?
- How many people were involved in the project? And what were their roles in the project?
- What's the design process of the project?
- What were the design principles of the project?
- What's your responsibility in the project?
- Have you used your personal experiences in the project?
- What are the personal experiences, if any, that you used in the project?
- How and when did you incorporate these experiences into your design work?
- How did you communicate these experiences to other team members?
- How did you (your design team) justify and evaluate these experiences?
- How did you (your design team) add these experiences into design decisions?

- Can you give some comments on designers' use of their personal experiences in interaction design practice?

Throughout phase one, participants shared information about the design projects including goals, scale, design process they used, and their contributions to the projects, as well as the information about their personal experiences and the design decision-making processes related to such experiences.

Each Interview in phase one 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.

After each interview, I asked designers to email me materials relevant to what they said in the interview, such as project progress reports, project presentation slides, the link to the internal project website, photos they took during the design process, system demos and screenshots, prototypes, and anything they were able to provide.

The goal of phase two was to examine the actual role of designers' personal experiences in the projects. So if one designer in phase one shared his story about how he incorporated his personal experiences in the project, in phase two I 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 phase two took about one hour. Not all designers were involved in this phase, depending on if their team members applied their personal experiences in the project.

4.3.3. *Follow-up Interview or Email*

A follow-up interview or email occurred when I needed to clarify the data collected in the in-depth interviews during the data analysis process. I emailed the questions to the related participants and let them to decide whether they would like to follow up by emails or further interviews.

4.4. Data Analysis

The data analysis for this study followed an iterative process, and was guided by a specific technique called “cross-case synthesis” (Yin, 2009, 156). Yin notes this technique “applies specifically to the analysis of multiple cases” (ibid). This technique considers each case study as “a separate study” (ibid), and then aggregates all their findings. As for this research, my analysis process generally consisted of three distinct stages, which were establishing a case study database, categorizing analysis, and comparing analysis. I present the work involved in each stage in the next sections.

4.4.1. Establishing A Database

Yin states, “every case study project should strive to develop a formal, presentable database, so that in principle, other investigators can review the evidence directly” (Yin, 2009, 119). He also argues a case study database could “increase the *reliability* of the entire case study” (ibid). He says a case study database generally includes “four components: notes, documents, tabular material, and narratives” (ibid).

In order to build a formal database for this study, each interview was transcribed once it was done. Also, when evidence from other data sources (mentioned in section 4.1) was received, it was downloaded from my email and saved in a folder on my laptop, which required a password to login. Information on the project websites and online articles relevant to the projects were saved as PDF files separately by using a web-browser add-on called “Save as PDF”. These files were put in the same folder as other received evidence. This work aimed to facilitate the subsequent steps of data analysis. In addition, any digital material (like word tables) generated in the process of data analysis was also saved in that folder.

4.4.2. Categorizing Analysis

The goal of categorizing analysis was to “fracture” (Strauss, as cited in Maxwell, 2005, p. 96) the text data (interview transcripts, PDF files, project progress reports, conference papers) and “rearrange them into categories” (Maxwell, 2005, p. 96). The categorizing process was based on a series of questions, which were called themes in this study (see table 3).

I began the categorization by reading all the data carefully and keeping in mind the questions. During this reading, a software application called Saturate was employed in order to easily mark the data (see Figure 2). The application is a free web-based open coding tool developed by Sillito from the University of Calgary (Sillito, 2010). The other reason I used this coding tool was because it could allow me to check the raw data in the same category easily, and the coded text data could be downloaded and opened in Excel as a spreadsheet, which organized both the coded data and their themes into columns and rows.

Also, while reading, I paid more attention to the stories that designers told about how they worked with their personal experiences, as I needed to identify if the experiences that designers used could be included in the scope of designers' personal experiences that I have defined in this study. After this step, the large volume of data was reduced and relative data were identified and classified. It is important to note that in this phase, data that didn't belong to any category but were also related to the research questions should also be marked.

Table 3. Themes for Categories

Theme 1	What are the design projects?
Theme 2	What are the contextual factors of the projects?
Theme 3	Have interaction designers applied their personal experiences in the projects?
Theme 4	What are their personal experiences?
Theme 5	Why did they use their personal experiences in the projects?
Theme 6	What did they find from their experiences?
Theme 7	How did they communicate their experiences to other team members?
Theme 8	How did they and/or their design team justify and evaluate their experiences?
Theme 9	How did they and/or their design team add their experiences into design decisions?

4.4.3. Comparing Analysis

Comparing analysis was central to the data analysis of this study. It took advantage of Yin's analysis technique, cross-case synthesis, aiming to draw out patterns that could illustrate and summarize the various aspects of design practice relevant to

designers' personal experiences in the context of the three studied projects. Yin recommends utilizing "word tables" (Yin, 2009, p.156) to "display the data from the individual cases according to some uniform framework" (ibid).

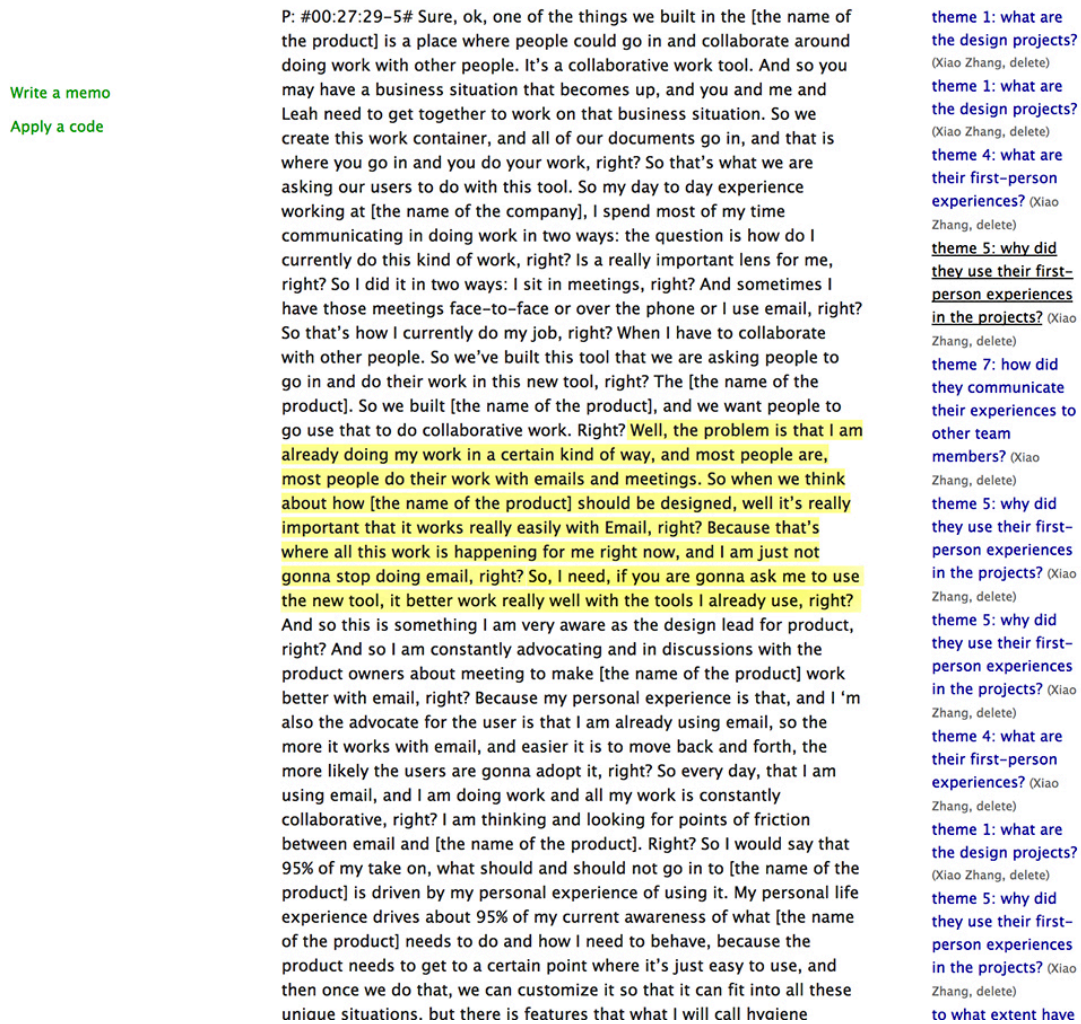


Figure 1. An Example of Coding by Using Saturate

My process started with building word tables, which were formatted like Table 4, Table 5, Table 6, and Table 7. I only created the first three tables initially (Table 4, Table 5 and Table 6), because I wished to do data analysis on the subunit (designer) level first, which included triangulating and corroborating the interview data by other types of evidence (see Table 5). Particularly, the aim of Table 4 was to present designers' background information including both their majors and the number of years they have worked as an interaction designer. Table 5 was intended to show two kinds of

information: (1) designers' descriptions of their usage practice comprising their personal experiences used as well as the relevant design activities; (2) other types of evidence that supported or denied the second kind of information. Table 6 was designed to display more data based on the corroborated usage practice. Such data were organized under five categories: (1) factors relevant to designers (their job positions and major responsibilities in the projects) that likely had an impact on the ways in which designers applied their personal experiences in the three cases; (2) the corroborated usage practice; (3) the roles of designers' personal experiences in their own project; (4) designers' perceptions of their usage practice; (5) the approaches through which designers communicated their personal experiences to their design team members.

In order to fill these tables, I reread the categorized data repeatedly, checked out other types of evidence, summarized the pertinent data and put them in each table. The contents of Table 6 are shown in chapter 5. It is important to note that apart from designers' background information and their relevant factors, the other information showed in the three tables was based on an iterative process of analyzing and synthesizing their pertinent data, rather than quoting the data directly.

Table 4. Background Information of Participants

Background Information	Case A		Case B		Case C	
	Designer 1	Designer 2	Designer 3	Designer 4	Designer 5	Designer 6
Education Background	Interaction Design	Interaction Design	Human-computer interaction	Human-computer interaction	Computer science and psychology	Communication design
The number of years working as an interaction designer	12 years	7 years	6 years	10 years	8 years	3 years

Table 5. Subunit Level Analysis - Corroboration of Usage Practice

Subunit	Designers' Descriptions of Their Usage Practice (Interview Data Source)		Evidence from Other Data Sources Supporting the Interview Data	Evidence from Other Data Sources Denying the Interview Data
	Experiences Used	Design Activity		
Designer 1	Day-to-day collaborative working experiences	Figuring out 'hygiene features' of the product	System screenshots	N/A
	Self-usage experiences of their own product	Finding out problems in their own products	Designer 2's interview	N/A
	Experiences of using contemporary technologies in the market	Generating design ideas	System screenshots	N/A
		Understanding opportunities, issues and barriers in contemporary technology design	Designer 2's interview	N/A
Designer 2	Experiences of using contemporary technologies in the market	Generating design ideas	System screenshots	N/A
		Understanding opportunities, issues and barriers in contemporary technology design	Designer 1's interview	N/A
	Self-usage experiences of their own product	Finding out problems in their own products	Designer 1's interview	N/A
Designer 3	Experiences of both trust and distrust relationships in health care services	Understanding essential user needs	Conference paper	N/A
			System screenshots	
			Project presentation slides	
Designer 4	Experiences of living in different countries	Setting up the project	The project itself	N/A
	Experiences of making pragmatic decisions	Task management	N/A	N/A
Designer 5	Experience of DIY	Design technique choosing	Digital prototypes	N/A
			Designer 6's opinion	
Designer 6	No			His own digital prototypes

Table 6. Subunit Level Analysis

Subunit	Job Position in the Project	Major Responsibilities in the Project	Corroborated Usage Practice		The Role of Designers' Personal Experiences in Interaction Design Practice	How Designers Perceived about Their Usage Practice	How Designers Communicated Their Personal Experiences to Their Design Team members
			Experiences Used	Design Activity			
Designer 1							
Designer 2							
Designer 3							
Designer 4							
Designer 5							
Designer 6							

After completing the three tables, I began to look for patterns relating to the usage practices of designers' personal experiences as well as designers' perceptions of such practices. Six patterns were generated through iterative comparison, contrast and synthesis within and cross the contents of the three tables.

Afterwards the case level analysis ensued. It was conducted based on another two word table. One has been presented in section 3.4.2.4 in chapter 3. It includes information with respect to each project, like project type, project scale and so on. The other one is Table 7 (its contents are showed in chapter 5). In Table 7, the factors with regard to designers were replaced by ones related to the three projects. And in each case, the same or similar usage practices were synthesized in order to facilitate comparison. Three patterns emerged in this stage that employed a similar process to the subunit level analysis.

Then the generated patterns in both two levels and all the tables were shown to my supervisor in scheduled meetings. This is "more than a matter of professional courtesy" (Yin, 2009, p. 182), because his review and comments could and indeed helped me to refine my analysis.

In the end, when the patterns were finalized, I created an additional word table to map the patterns and their evidence with the research questions they addressed. This table, and all the emerged patterns along with their evidence are displayed in chapter 5.

Table 7. Case Level Analysis

Case	Project Type	Project Team	Project Scale	Corroborated Usage Practice		The Role of Designers' Personal Experiences in Interaction Design Practice	How Designers Perceived about Their Usage Practice
				Experiences Used	Design Activity		
Case A							
Case B							
Case C							

4.5. Reliability and Validity

Reliability is concerned with “if a later investigator followed the same procedures as described by an earlier investigator and conducted the same case study all over again, the later investigator should arrive at the same findings and conclusions” (Yin, 2009, p. 45). So the aim of reliability is to “minimize the errors and biases in a study” (ibid). Yin recommends using a case study protocol and developing a case study database to increase the reliability of a case study (Yin, 2009). Both tactics were adopted in this study. I developed a case study protocol (presented in section 4.2.1) before I conducted the formal case studies, and also refined it by doing a pilot study. Data collection of the three cases all followed the revised case study protocol to ensure the field procedures were consistent among them. Also, a case study database was built to show all my collected raw data and the materials generated in data analysis process, aiming to facilitate access by later researchers.

Beyond reliability, the quality of case study research is often established by other tests, which are construct validity, internal validity, and external validity (Yin, 2009). Among them, internal validity is used “for explanatory or causal studies only and not for descriptive or exploratory studies” (Yin, 2009, p. 40), so the other two tests were dealt

with by several tactics in this study (as a descriptive case study approach was adopted by this study).

Construct validity implies “Identifying correct operational measures for the concepts being studied” (Yin, 2009, p. 40). In this study, multiple sources of evidence (presented in section 4.1) were collected. And during the process of data analysis, interview data were triangulated and corroborated by evidence from other types of sources, and patterns generated for describing interaction design practices relevant to designers’ personal experiences were reviewed by my supervisor (presented in section 4.4.3), aiming to increase construct validity of this study.

External validity is concerned about “whether a study’s findings are generalizable beyond the immediate case study” (Yin, 2009, p. 43). This study adopted a multiple case study approach, which requires that the selection of multiple cases should follow a replication logic. This logic treats multiple cases as multiple experiments that “rely on *analytic* generalization” rather than “*statistical* generalization” (ibid). So once a set of findings has been replicated in multiple cases, they “might be accepted” (ibid, p. 44) although “further replications had not been performed” (ibid, p. 44).

4.6. Summary

In this chapter I have presented four types of data sources of this study, which are documentation, archival records, in-depth Interviews, and digital artifacts. Each of them takes many forms. I have also detailed the work involved in the preparation stage for formal data collection, which are development of a case study protocol, execution of a pilot study, and selection of formal cases. The essential interview questions and the field procedures of data collection designed in the case study protocol were evaluated in the pilot study. According to the lessons learned from the pilot study, the case study protocol was refined. The refined protocol guided the formal data collection in the three selected cases, which consisted of three stages: email questionnaire, in-depth interviews and follow-up interview or email. Then, I elaborated my data analysis process guided by a technique called cross-case synthesis. Nine patterns describing the interaction design

practice relevant to designers' personal experiences emerged. Finally, the tactics employed to increase the reliability and validity of this study have been described.

The next chapter will present the emerged patterns and their evidence.

5. Case Study Analyses

Designers' personal experiences have been applied in the three cases, but the detailed practices varied from designer to designer, and from case to case. This chapter draws out such practices through presenting patterns generated from both subunit level and case level data analysis, and thereby to answer the two research questions of this study. Table 8 gives an overview of the patterns and the related research questions each of them could address.

Table 8. An Overview of Generated Patterns

The Level of Analysis	Pattern Name	Research Questions Addressed
Subunit Level	Pattern 1: Using contemporary products pattern	What
	Pattern 2: High-level design pattern	How
	Pattern 3: Detailed-level design pattern	How
	Pattern 4: Authority and opportunity pattern	How
	Pattern 5: Responsibility pattern	How and What
	Pattern 6: Communication pattern	How
Case Level	Pattern 7: Commercial business project pattern	How and What
	Pattern 8: Exploratory research project pattern	How and What
	Pattern 9: Understanding user needs pattern	How and What

As for the subunit level patterns, pattern 1 describes designers' views of their personal experiences of using contemporary products in the market. Patterns 2 and 3 describe how designers perceived when they used their personal experiences in their design practice and the precondition of such perceptions. Patterns 4 and 5 depict how designers' decision-making authority and their responsibilities in the projects were related to the usage practices of their personal experiences. Pattern 6 presents how designers communicated their personal experiences to their team members. Relating to

the case level patterns, they summarize the impacts of different project types on the usage practices of designers' personal experiences in the three projects.

In the following sections, I first describe the subunit level patterns, and then the case level patterns. 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, I cannot present them in this thesis as evidence. But direct quotations from the case study interview transcripts are used a lot in order to prove their pertinent patterns and also assist the potential readers of this thesis to easily learn about how the interviewed designers use their personal experiences in their design practices. Such interview data have been triangulated and corroborated by other types of evidence in data analysis.

5.1. Subunit Analyses

5.1.1. *Using Contemporary Products Pattern*

Using contemporary products in the market to get direct personal experiences was considered as an indispensable part of designers' work.

This pattern was observed in Case A (see Table 9⁵). Both designers (Designer 1 and Designer 2) in this case mentioned their personal experiences of using contemporary technologies several times in their interviews. They considered that using and experiencing contemporary products in the market was part of their design jobs.

So it's important that I'm using contemporary tools all the time, so for instance, I have the latest iPad, I have the latest iPhone, but I also have access to Android and Windows phone 7 mobile technologies. Mobile is a really important direction for us as a company, it's a huge massive technology paradigm shift, so I need to be using mobile tools all the times so that I'm familiar with what are the opportunities and also the issues, and barriers. And so through that usage, I understand

⁵ Table 9 presents part of the contents of Table 6, which was built for subunit level analysis.

through my personal experience, how we can apply certain ideas to our own products, and it's something that designers are always doing, and in that way, I am always working, always, always working, I am always paying attention to everything and all the technologies I am using, I'm reading blogs and making sure I got the latest version of this or that software, and it is just a part of the job, is you have to keep your thumb on the pulse of technology, so and without that, you end up becoming, you know, out of the loop if you will a little bit your skill set becomes antiquated, because if you wanna work in technology, you have to be careful that new technology doesn't deskill you, right?
(Designer 1)

Facebook....I bet if I didn't have this job, if I wasn't an interaction designer, I will not have a Facebook account.... There is something when I look at Facebook. For examples, real life examples on Facebook help me to understand certain interaction problems, right? You know, like I have 200 people on my Facebook, and I can go through the list. Ok, what happens, is there a page? Is it two pages? You know, those kinds of problems. So Facebook is an example, because I don't really using it ever other than for that purpose.

Of course I look at other similar products, and then look at what might be a better solution based upon what our user's knowledge might be, right? So not just what I feel is the best solution, but what the potential users going to be, right? ... I would say that, that was probably be something that's not just passive, it's active. We are actively looking at, like as part of our job, what others are doing.
(Designer 2)

However, they hold different attitudes towards the significance of such kinds of experiences in design practice. Designer 1 asserted these types of experiences could help him understand opportunities, issues and barriers in existing technology design without usability testing, and also inspire him to come up with design ideas with regard to Case A. As for Designer 2, his feelings about such experiences were complicated. On the one hand, he agreed with Designer 1's argument to some extent, and acknowledged he drew his inspiration from his experiences of using existing technologies for designing the product of Case A.

I love to look at existing products. I want to know what other people are doing in the same area. Are user features similar in like, you know, application X, Y, Z. So I interact with them, I analyze them, I get a sense of how they feel, and then I have a sense of, like, how would this work in our application. And I have been tried to take the best things out of those applications, you know, combine them, make them better and add something new.
(Designer 2)

On the other hand, he remained skeptical about the value of such kind of experiences in design practice, as he challenged the idea-generation approach, which depends on seeing how other designers frame their work. He argued this approach might limit designers' own creativity on their own work.

Generally I think all team members use a lot of Apple products, and a lot of ideas when I am looking at, you know, I really feel there are very influenced by Apple. Now I am not saying there's a good or bad thing, but I feel that sometimes we lean a little bit too much on Apple, you know, how they approach things. And I think sometimes you become lazy and because oh apple does it, so I am gonna do it in this way too, and I don't know if that's the best approach or if there is other room for innovation. (Designer 2)

Table 9. Subunit Level Analysis – Usage Practice and Designers' Perception

Subunit	Job Position in the Project	Major Responsibilities in the Project	Corroborated Usage Practice		How Designers Perceived about Their Usage Practice
			Experiences Used	Design Activity	
Designer 1	Design Lead	Working with product owners to decide what design features will be built in the products	Day-to-day collaborative working experiences	Figuring out 'hygiene features' of the product	Confident
		Looking for problems that exist within the launched version of the product	Self-usage experiences of their own product	Finding out problems in their own products	Confident
		Helping the design team solve different design problems	Experiences of using contemporary technologies in the market	Generating design ideas	An indispensable part of his job.
		Working with usability team to do usability testing		Understanding opportunities, issues and barriers in contemporary technology design	
Designer 2	Interaction Designer	Designing interaction flows	Experiences of using	Generating design ideas	An indispensable part of his job;

Subunit	Job Position in the Project	Major Responsibilities in the Project	Corroborated Usage Practice		How Designers Perceived about Their Usage Practice
			Experiences Used	Design Activity	
		Making mid-level fidelity mockups	contemporary technologies in the market		acknowledged the impact of such kind of personal experiences on his design work; but unsure about when, where, and how he applied such experiences in this project; also challenged such kind of idea generation approach and argued it might limit designers' creativity
			Self-usage experiences of their own product	Finding out problems in their own products	Confident
Designer 3	Design Lead	User study	Experiences of both trust and distrust relationships in health care services	Understanding essential user needs	Confident
		Designing the system			
		System testing			
Designer 4	Project Manager	Setting up the project	Experiences of living in different countries	Setting up the project	Confident
		Contacting with health authorities	Experiences of making pragmatic decisions	Task management	Confident
Designer 5	Principle Designer	Setting up the project	Experience of DIY	Design technique choosing	Confident
		Designing the system			
Designer 6	Interaction Designer	Designing the system	Experiences of using existing technologies	System interface design	Acknowledged the impact of such kind of personal experiences on designers' job; but unaware of his use of such experiences in this project

5.1.2. *High-level Design Pattern*

Designers were confident of working with their personal experiences when their jobs were more related to high-level design⁶.

This pattern was seen in all three cases (See Table 9). 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' 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

my day to day experience working at [the name of the company], I spend most of my time in doing work in two ways: I sit in meetings, right? And sometimes I have those meetings face-to-face or over the phone or I use email, right? So that's how I currently do my job when I have to collaborate with other people.

We built [the name of the product], and we want people to go use that to do collaborative work. Well, the problem is that I am already doing my work in a certain kind of way, and most people are, most people do their work with emails and meetings. So when we think about how [the name of the product] should be designed, well it's really important that it works really easily with Email, right? Because that's where all this work is happening for me right now, and I am just not gonna stop doing email, right? So, I need, if you are gonna ask me to use the new tool, it better work really well with the tools I already use, right?

So this is something I am very aware as the design lead for product, right? And so I am constantly advocating and in discussions with the product owners to make [the name of the product] work better with email, right? ... So the more it works with email, and easier it is to move back and forth, the more likely the users are gonna adopt it, right? So every day, I am thinking and looking for points of friction between email and [the name of the product]. 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)

⁶ In this thesis, 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.

Also, in this case, both the two designers (Designer 1 and Designer 2) noted that their self-usage experiences of the product of Case A helped them find problems within their own product.

So we have meetings to talk about what we gonna build next because we had this spring model, and during those meetings, we will talk about our own experiences with the product and... we will talk about where, what I would call the points of friction are with the product, where is the problems with the product right now? What would make it easier in using the product? And because we used the tool for our own work, we are always looking through the lens of how could we make this easier for us. (Designer 1)

...this is actually one of the first things that I have ever designed for [the name of the product]. So when I first came, I was tasked to design this chat (a feature of the product). ... I think that I have learnt a lot through using it and through hearing a lot of user feedback. So part of it is when somebody messages you, you often don't see it blinking that there is a message pending. So that's something that's missing from this, and I have heard that from other users, and from using that myself. (Designer 2)

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.

Because you can realize the value of trust by either experiencing trust or experiencing mistrust, ... in my case, both of these things happen, one was very personal experience in terms of realizing the trust by my childhood experience and in the field, it was not very personal in the sense it was not concerning my life, but then 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 that wasn't my goal, but I thought trust would be a fundamental part of my system. (Designer 3)

Also, he explained 'lack of trust' among the surveillance stakeholders meant these people were unsure if the other people did their job properly, rather than suspecting

other people to do something wrong. He gave two examples to illustrate the meaning of 'lack of trust'.

...I realized that during, you know, interacting with so many people, the health worker would say, "sometimes my authorities or my superiors, they don't think I am doing my job well, but the reality is I doing my job really well". So same thing with the doctors, the doctor might say "oh, I am not sure if my health worker goes to all the villages every day, Maybe he is just sitting somewhere and drinking tea something or something like that". I am not saying all the doctors say like that, but there are some cases, which show the lack of trust.

I found that the health officer was not 100% satisfied with doctors' work. And sometimes what happens is the disease's number was manipulated so that the doctors under report the cases. Nobody wants to be in the red zone, so they would under report the cases. And this is the classic flow of the existing system, which is paper based. Because the doctors have to report at the end of every week for example, so in the week time, they can reverse calculate the average level of Malaria cases to be in a safer zone, because they have time and they can think.

(Designer 3)

With respect to Designer 3's judgment (creating trust relationships between disease surveillance stakeholders was a fundamental part of designing the system), Designer 4 didn't explicitly express the same idea in his interviews. But when he was asked what contextual factors influenced the design of the system, one factor in his answer was about the discrepancy between the real number of disease cases and the disease surveillance statistics reported by the existing paper-based system. As mentioned in one of the two examples above, Designer 3 considered this factor as one major reason leading to the 'distrust' among stakeholders. Therefore, it can be conclude that both of designers had the same concern about the system, which was its credibility for reporting disease statistics.

To approach this concern, the tactics they used in designing their system was to have health workers working at the primary level health centers report the diseases on daily basis, and giving both health workers and doctors who are working at the same health centers no opportunity to manipulate the data. Designer 3 explained the rationale for this tactic.

...as soon as in the evening the health worker knows about how many cases of malaria, he reports it right away, there is no, he doesn't have a bigger picture of how many cases he has reported last week or this

week, or even last month, there is no big picture, so he cannot, he doesn't have an opportunity to manipulate the data, and that's one of the smarter ways of, you know avoiding mistrust, I wouldn't say this creates trust, so creation of trust was a by-product of the system, what we did manage was to avoid creating mistrust.

...But our system did on the other hand is reporting happens every day, so they never get to see the big picture. And once you reported a data, you cannot change it after a day. So we take information every day, and never show the doctor the big picture. If they got the big picture, then they will manipulate the data. But we do not allow that opportunity to manipulate the data at all. (Designer 3)

Figure 3 presents the interface of their designed system for reporting disease frequencies.

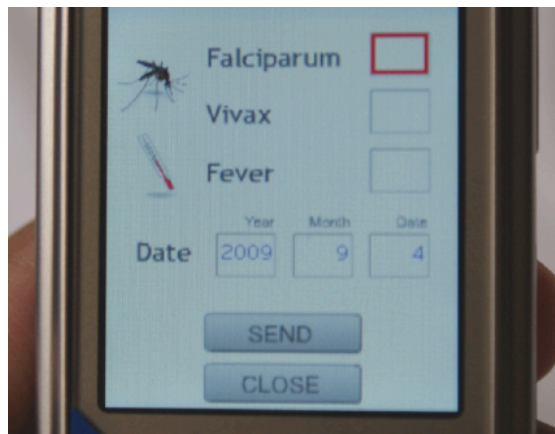


Figure 2. System Screenshot of the System of Case B

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.

I think one aspect I can definitely see here and which has being visible in the project is that I have a kind of sensitivity to different types of cultures. ... In my past, I have lived in several different countries. I have spent a lot of years in the UK, and then in the US, in Finland and then in India. And I had also done some user research in lots of countries like, China, and 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 or I have many possibilities. ... I could have a choice to select projects that don't require myself to do research in the context that is very different from my own. ... But I chose to develop this system for rural area in 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, at certain point, I mean, you cannot over analyze things. ... You never have proper resources or time to analyze things like over and over again so that perfectly understand them. And therefore, sometimes it's really about making some pragmatic decisions.

Similarly, in this [the name of case B], there was a sense of pragmatism. ... We didn't have full time to conduct, let's say, 6 months ethnographic observations into the disease surveillance system. ... I mean I am not saying that we didn't do research. ... 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, like a kind of, a 360 degrees understanding of the environment, but ... we had to make decision that 'ok, this is what we focus on'. And so I would say this kind of pragmatism ... you need 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 school learning, 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 different materials, like paper, OmniGraffle, and HTML, to create different versions of prototypes, aiming to achieve the design solutions they satisfied.

My grandfather, he was a tinker, he was a very innovative person, the handy man. ...He looked like everything as if it had 90 different purposes when they were done with. ...He uses lots of different pieces of random things to accomplish whatever goal he had....He would have random bits of like materials that we would mostly consider trash, but he would never saw things that way, he would like adapt everything in order to build whatever he wanted in order to make his life a little bit better, and he was like a prototype.

I was constantly learning from the way he was working on his workbench, and I spent a lot of time with my grandfather in the summers around this area and stuff, so I learned a lot of that....So like

my strongest design process step is prototyping because I inherited from my grandfather this way of seeing everything, like we can just reshape that, we can take these random things we have, we can put them together and maybe make something, and when I see the end result and it still not right, we can just keep trying new things with different procedures.

... 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 something, like what you are trying to accomplish. ... They change everything about your design. ... So that's starting from paper, moving to OmniGraffle, moving to like html, and then like an add-on, all these things let you learn something new on each step, and that's the part about prototyping that I think I didn't take from school. When I was in school, there weren't a lot drill in prototyping. (Designer 5)

5.1.3. 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 design⁷.

This pattern emerged in Case A and Case C (see Table 9). In Case A, although Designer 2 admitted his experiences of contemporary products had an impact on his design work (as mentioned in *Using contemporary products pattern*), 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 used them. He just knew he actually did that. He thought that such kinds of action might occur subconsciously.

I mean I fully think that my personal life, things that happen to me, you know, have an impact upon everything that I do, but I don't know how. I think that that's very much subconscious.

I just don't know how to uncover that, I guess I am sure that I do, I just don't know how to actually tell you about it, because I am

⁷ Detailed-level design in this thesis 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.

unaware, because I am probably do it, but I find it hard for me to think and tell you specific examples, because I just don't know how...I can just recall the action because I think that happens. Of course I use my first person experience in things that I design. (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 (see Table 5 in chapter 4). However, from the prototypes he created during the design process (see Figure 4), 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 I was filling the Table 5 and doing data triangulation.

Yeah, I would say that there were many of first person experience going into this thing. But it's hard to say like how much myself be really like put into this thing. But obviously, you know, your previous experiences with other kinda product and interactivity throughout the web, obviously inform the decisions you do make, and you are trying keep the visual language kinda consistent with what people might be familiar with. But in terms of like anything specific that went into this project. I can't think of anything that was like really stands out. (Designer 6)

5.1.4. 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.

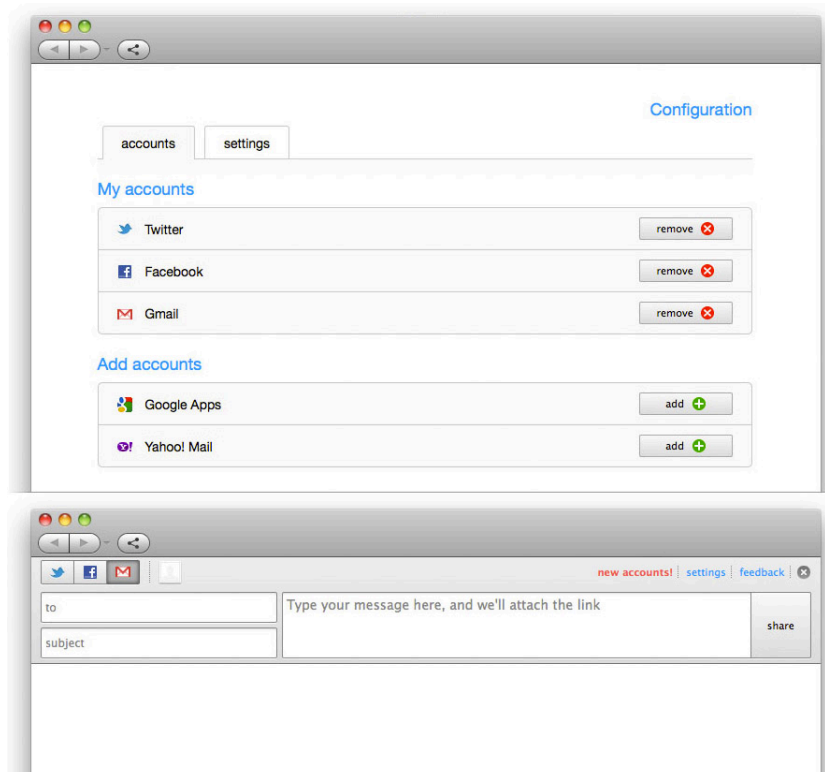


Figure 3. A Prototype Created by Designer 6 in the Design Process of Case C

This pattern generated through comparison within and cross the three cases (See Table 10⁸). 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. As stated in the introduction of case A (section 3.4.2.1 in chapter 3), in this project, only product owners and the design lead (Designer 1) have the right to decide what design features should

⁸ Table 10 presents part of the contents of Table 6, which was built for subunit level analysis.

go into the product.

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

For Case C, in terms of what I 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.

Yeah, I mean I think that's because they were looking for that direction from me, but they probably not questioning. Is like why we are taking this approach or why we use 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. However, the two designer in Case B 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, which can be easily seen from Table 10. 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.

5.1.5. Responsibility Pattern

Designers' responsibilities were relevant to what personal experiences they used and in what design work.

This pattern is relatively visible, but was also observed through comparison within and cross the three cases. It shows the reasons designers used their personal experiences, and the specific role such personal experiences played in a project were relevant to designers' responsibilities in the project. All the evidence of the aforementioned patterns could support this pattern. Table 10 summarizes such evidence

including designers' major responsibility in their projects and their usage practices of their personal experiences. This pattern can be seen easily.

Table 10. Subunit Analysis – Usage Practice and the Role of Designers' Personal Experiences in Interaction Design Practice

Subunit	Job Position in the Project	Major Responsibilities in the Project	Corroborated Usage Practice	
			Experiences Used	Design Activity
Designer 1	Design Lead	Working with product owners to decide what design features will be built in the products	Day-to-day collaborative working experiences	Figuring out 'hygiene features' of the product
		Looking for problems that exist within the launched version of the product	Self-usage experiences of their own product	Finding out problems in their own products
		Helping the design team solve different design problems	Experiences of using contemporary technologies in the market	Generating design ideas
		Working with usability team to do usability testing		Understanding opportunities, issues and barriers in contemporary technology design
Designer 2	Interaction Designer	Designing interaction flows	Experiences of using contemporary technologies in the market	Generating design ideas
		Making mid-level fidelity mockups		
Designer 3	Design Lead	User study	Experiences of both trust and distrust relationships in health care services	Understanding essential user needs
		Designing the system		
		System testing		
Designer 4	Project Manager	Setting up the project	Experiences of living in different countries	Setting up the project
		Contacting with health authorities	Experiences of making pragmatic decisions	Task management
Designer 5	Principle Designer	Setting up the project	Experience of DIY	Design technique choosing
		Designing the system		
Designer 6	Interaction Designer	Designing the system	Experiences of using existing technologies	System interface design

5.1.6. Communication Pattern

Designers reported a tendency not to share their personal experiences (ones they applied in their projects) with their team members, but to communicate the design judgments or design decisions made on the basis of such experiences.

This pattern is observed in the three cases as well (See Table 11⁹). 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, I 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, and he has a very strong voice in determining what we build. If he agrees, then no one disagrees. So if I want something build in the product, I will go to him, and I will talk to him and 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 my view. ... The developers,

⁹ Table 11 presents part of the contents of Table 6, which was built for subunit level analysis.

their area interests would not be the same as the area interests of mine. For them, the ultimate goal was how to create a system that does not fail often. So I would translate them into what they could do, like how could we create a system that could work even without rebooting for so many days, how can it work so that as same as which is 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 designer. ... Yeah, for the prototyping, I talked with the designer that I work with the motive of doing the prototypes and getting user testing, and then kinda really looping on this like prototyping, interaction. (Designer 5)

Table 11. Subunit Analysis – Usage Practice and How Designers Communicated Their Personal Experiences to Their Design Team members

Subunit	Job Position in the Project	Major Responsibilities in the Project	Corroborated Usage Practice		How Designers Communicated Their Personal Experiences to Their Design Team members
			Experiences Used	Design Activity	
Designer 1	Design Lead	Working with product owners to decide what design features will be built in the products	Day-to-day collaborative working experiences	Figuring out 'hygiene features' of the product	Not to share his personal experiences; but to transmit his superior's order once the superior had agreed with his judgments.
		Looking for problems that exist within the launched version of the product	Self-usage experiences of their own product	Finding out problems in their own products	Directly talked about his usage experiences
		Helping the design team solve different design problems	Experiences of using contemporary	Generating design ideas	N/A

		Working with usability team to do usability testing	technologies in the market	Understanding opportunities, issues and barriers in contemporary technology design	
Designer 2	Interaction Designer	Designing interaction flows	Experiences of using contemporary technologies in the market	Generating design ideas	N/A
		Making mid-level fidelity mockups		Self-usage experiences of their own product	Finding out problems in their own products
Designer 3	Design Lead	User study	Experiences of both trust and distrust relationships in health care services	Understanding essential user needs	Not to share his personal experiences; but to translate his design judgments/decisions made on such experiences into something that developers were interested in or care about; attributed such oblique communication approach to his personality
		Designing the system			
		System testing			
Designer 4	Project Manager	Setting up the project	Experiences of living in different countries	Setting up the project	N/A
		Contacting with health authorities	Experiences of making pragmatic decisions	Task management	N/A
Designer 5	Principle Designer	Setting up the project	Experience of DIY	Design technique choosing	Not to share his personal experiences; but to select convincing reasons to explain his design judgments
		Designing the system			
Designer 6	Interaction Designer	Designing the system	Experiences of using existing technologies	System interface design	N/A

5.2. Case Level Analyses

As previously stated in the data analysis section, when I did case level analysis, the factors related to designers in the Table 6, such as their job positions and their major responsibilities in the project, were replaced by the factors relevant to the projects, such as project type and project scale, because I wished to see if there is a link between project factors and the usage practices of designers' personal experiences. Table 12 is the word table I used for case level analysis. Similar to the subunit level analysis, comparison, contrast, and synthesis were made among the three cases. Three patterns emerged.

- *Commercial business project pattern.* In a commercial business project, designers' personal experiences of using contemporary products in the market were essential to interaction design practice. Such experience was a source for design ideas and design insights.
- *Exploratory research project pattern.* In an exploratory research project, designers' personal experiences were used in a more flexible way, and their role was beyond a source for design ideas and design insights.
- *Understanding user needs pattern.* Whether in a commercial business or exploratory research project, designers' personal experiences could be a lens for seeking or understanding part of user needs.

As shown in Table 12, Case A is a commercial business project, while Case B and Case C are exploratory research projects. So if we consider Case B and Case C as one group and Case A as the other group, then compare the usage practice of designers' personal experiences that happened in the two groups, the above-mentioned two patterns – *commercial business project pattern* and *exploratory research project pattern* – can be easily seen. They show that the type of a project was a key factor that influenced designers' usage practice of their personal experiences. Specifically, in a commercial business project, designers' personal experiences of contemporary products were important for their design job. And such experiences were utilized more frequently, as they were a source for both design ideas and design insights about technology design. In an exploratory project, a variety of designers' personal experiences were applied to different tasks, so the roles such experiences played in the project were multiple. Regarding the *understanding user needs pattern*, it was generated based on the

similarity between Case A and Case B. It presents that no matter what kind of project, designers' personal experiences could be used for understanding user needs.

Although these three patterns are obvious when you look at Table 12, they are still important to this study, because they summarize the interaction design practice relevant to designers' personal experiences on a project level. Yin points out one common pitfall of embedded multiple case studies is that investigators often concentrate on the subunit level analysis and ignore the significance of case level analysis (Yin, 2009).

Table 12. Case Level Analysis

Case	Project Type	Project Team	Project Scale	Corroborated Usage Practice		The Role of Designers' Personal Experiences in Design Practice	How Designers Perceived about Their Usage Practice
				Experiences Used	Design Activity		
Case A	A commercial business project	A subsidiary located in Vancouver	About 50 people involved in the project team	Day-to-day collaborative working experiences	Figuring out 'hygiene features' of the product	A lens for seeking essential user needs	Confident
				Self-usage experiences of their own product	Finding out problems in their own products	A source for design insights	Confident
				Experiences of using contemporary technologies in the market	Generating design ideas Understanding opportunities, issues and barriers in contemporary technology design	A source for design ideas and design insights	An indispensable part of his job.
Case B	An exploratory research project	A lab located in Bangalore	11 people involved in the project team	Experiences of both trust and distrust relationships in health care services	Understanding essential user needs	A lens for understanding a part of essential user needs	Confident

Case	Project Type	Project Team	Project Scale	Corroborated Usage Practice		The Role of Designers' Personal Experiences in Design Practice	How Designers Perceived about Their Usage Practice
				Experiences Used	Design Activity		
				Experiences of living in different countries	Setting up the project	A basis for decision making	Confident
				Experiences of making pragmatic decisions	Task management		Confident
Case C	An exploratory research project	An office located in Vancouver	5 people involved in the project team	Experience of DIY	Design technique choosing	An enlightening source for applying a design technique	Confident
				Experiences of using existing technologies	System interface design	A source for design ideas	Unaware of his use of such experiences in this project

5.3. Summary

In this chapter, I have elaborated the patterns that were generated in data analysis. They summarize designers' practices around their personal experiences in three particular industrial interaction design projects. Table 13 maps such patterns and their sources of evidence with the research questions they could address. On the subunit level, the patterns show that designers incorporated diverse personal experiences into multiple aspects of their design work. The experiences they used and the pertinent design activities were relevant to their responsibilities in the projects. Also, some of them worked with their personal experiences with confidence while some of them used their personal experiences intuitively or subconsciously. In addition, their use of their personal experiences was an individual activity, and they hesitated sharing their

personal experiences with their team members. Moreover, their degree of authority in making design decisions had a lot to do with the opportunities they could have to utilize their personal experiences in their work. On the case level, the type of a project was an important factor that influenced the diversity of the ways in which designers' personal experiences could be used.

The next chapter will discuss the implications of such findings for interaction design from several perspectives.

Table 13. Patterns and Research Questions

The Level of Analysis	Pattern	Sources of Evidence	Research Questions Addressed
Subunit Level	Using contemporary products in the market to get direct personal experiences was considered as an indispensable part of designers' work. (Using contemporary products pattern)	Designer 1, 2	What
	Designers were confident of working with their personal experiences when their jobs were more related to high-level design. (High-level design pattern)	Designer 1, 3, 4, 5	How
	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. (Detailed-level design pattern)	Designer 2, 6	How
	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. (Authority and opportunity pattern)	Within-case and cross-case comparisons (Case A, B, C)	How
	Designers' responsibilities were relevant to what personal experiences they used and in what design work. (Responsibility pattern)	Comparison among all the designers	How and What
	Designers reported a tendency not to share their personal experiences (ones they applied in their projects) with their team members, but to communicate the design judgments or design decisions made on the basis of such experiences. (Communication pattern)	Designer 1, 3, 5	How

The Level of Analysis	Pattern	Sources of Evidence	Research Questions Addressed
Case Level	<p>In a commercial business project, designers' personal experiences of using contemporary products in the market were essential to interaction design practice. Such experience was a source for design ideas and design insights.</p> <p><i>(Commercial business project pattern)</i></p>	Case A	How and What
	<p>In an exploratory research project, designers' personal experiences were used in a more flexible way, and their role was beyond a source for design ideas and design insights.</p> <p><i>(Exploratory research project pattern)</i></p>	Case B Case C	How and What
	<p>Whether in a commercial business or exploratory research project, designers' personal experiences could be a lens for seeking or understanding part of user needs.</p> <p><i>(Understanding user needs pattern)</i></p>	Case A Case B	How and What

6. Discussion

The aim of this chapter is fourfold: (1) to summarize the contribution of designers' personal experiences to interaction design practice; (2) to call for the need to explicitly recognize the legitimacy of using designers' personal experiences in interaction design practice; (3) to discuss implications of the findings of this study for interaction design; (4) to present the limitations of this study.

6.1. Summarization of the Contribution of Designers' Personal Experiences to Interaction Design Practice

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 reviewed in section 2.1.2 in Chapter 2, and also enlarge our view on the contribution of designers' personal experiences to interaction design practice. Table 14 summarizes all the contribution uncovered by different studies including both the existing ones and my study.

While many researcher and designers may not be surprised by these findings (especially for practitioners from traditional design fields such as industrial design and architecture), I cling (possibly naively) to the expectation that this study could encourage designers who have used their personal experiences in their design projects to report and share their work, thus facilitating our design community to gain a more deep and comprehensive understanding about the possibilities and limitations of using designers' personal experiences in interaction design practice.

Table 14. Summarization of the Contribution of Designers' Personal Experiences to Interaction Design Practice Uncovered by Existing Research and This Study

Existing Research	Sengers (2006)	Helping design for richer user experience.
	Coffin (2011)	Helping generate design concepts of an infant soothing and a premature apnea therapy blanket.
	Erickson (1996)	Teaching designers or researchers about the intermingled aesthetic, utilitarian, and design issues involved in both creating and using a system.
	Gaver (2006)	
	Neustaedter & Sengers (2012)	
This Study	Case A	Helping generate design ideas;
		Helping understand opportunities, issues and barriers in contemporary technology design;
		Helping figure out 'hygiene features' of their own product;
		Helping find problems in their own product.
	Case B	Helping understand essential user needs;
		Helping set up the project;
		Helping manage design tasks.
Case C	Helping choose design technique.	

6.2. The Need to Explicitly Recognize the Legitimacy of Using Designers' Personal Experiences in Interaction Design Practice

Using designers' personal experiences in interaction design practice goes against the rational and objective approaches advocated by HCI community (Goodman, 2011; Sengers, 2006; Fantauzzacoffin, 2011). 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 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 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 that they think "HCI has a rationalist design tradition which values well-defined, objective and generalizable principles to find optimized solutions to a design problem" (Fantauzzacoffin, 2011, p. 1).

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" (Schön, 1982, p. 49) and also argues "the workday life of the professional work depends on tacit knowing-in-action" (ibid). 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 kind of useful design resource, thus to helping to minimize bias in their work.

6.3. Implications for Interaction Design

The case study results also have relevant implications for interaction design. I discuss them in three areas: design management, user-centered design, and design education.

6.3.1. *Design Management*

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, I particularly discuss the meanings for a project manager, a lead designer, and a designer. In order to easily discuss and present the meanings, I presume a design team adopts either a vertical organizational structure¹⁰ or a horizontal organizational structure¹¹.

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.

¹⁰ "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" (Myers, 2013, p. 1)

¹¹ "Horizontal organizational structure is a form of managing workers in which decision-making is spread among workers along horizontal lines" (What is a horizontal organizational structure, 2013, para.1)

One possible way to mitigate such limitation would be to question high-ranking designers' design judgments and encourage lower-ranking designers 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 should 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 should actively share their design decision and the personal experiences used to see other people's comments.

6.3.2. *User-centered Design*

User-centered design is a design methodology based upon “the active involvement of users” (Mao et al., 2005, p.105) in the design process in order to meet their increasing needs and improve usability. “User-centered design is distinguished by a few common practices: user studies, user feedback, and user testing” (Larry, 2004, p. 2). It is commonly believed that user-centered design is “a step forward from the technology-centered focus of bygone days” (ibid, p. 1). However, Larry (2004) argues, “none of its core practices--user studies, user feedback, and user testing—really have very much to do with design¹² itself” (p. 3). And he also says “books on user-centered design often have much to say about users, user studies, human perception and cognition, human-machine interaction, user interface standards and guidelines, and usability testing but relatively little to say about design” (p. 3). However, designers are

¹² For Larry, design refers to the activities aiming to generating ideas or solutions.

required to produce new and useful ideas constantly as part of their routine work. Thus, there is a gap between using user-centered design approach and generating design solutions.

However, in terms of the findings of this study, it seems that the approach of using designers' personal experiences in interaction design practice could help address this problem in some extent. This is because compared with user information that is 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. As Designer 4 in one of his interviews said, "Designers' personal experiences could contribute to the leap that designers make from the findings of user study to design solutions." In this study, Designer 1 translating his day-to-day experience of collaborative work into the system's 'hygiene features' is a good example. Hence, the implication here is that the approach of incorporating designers' personal experiences into design practice can be used as a complement to user-centered design methods to yield similar or better understanding of users as well as their needs and expectations, and thus helping generate design concepts and solutions. But there is a proposition in this situation, which is that designers should be confident that they can represent their users.

6.3.3. *Design Education*

The findings of this study describe how designers' personal experiences were incorporated into interaction design practice and the contributions of such experiences to the practice. But an underlying focus of this study is to bring attention to the value of designer's judgment and interpretation in design practice, because good practice around designers' personal experiences requires that a designer can first interpret both the current design situation and his personal experience appropriately, and then make a proper design judgment. Interpretation and judgment in this context contains transformation of the experience into design information, evaluation of the degree of the fitness of such information for the design situation, and finally finding a way to approach the design situation through leveraging the information. Certainly this process could be tacit.

Therefore, in this regard, the implication of the findings of this study for design education is that design students should develop three kinds of skills: the sensitivity to their personal experiences, which is the basis for using their personal experiences in their practice; and interpretation and judgment skills. For developing skill in judgment, Löwgren and Stolterman recommend that students construct their "own assumptions and beliefs" (2005, p. 5) "critically and independently" (ibid). With regard to developing skill in interpretation, design teachers' guidance and students' practice are indispensable. In reference to increasing the sensitivity to their personal experiences, students should be advised to form the habit of observing and reflecting the events and activities occurred in their daily lives, especially how they and other people use technologies and artifacts. Some design tools, like sketch, mood board and storyboard, should also be recommended to students for recording both their experiences and the insights from such experience. Some design educators may have used these strategies in their design courses, but here it is important to reemphasize them, because these strategies will provide students with opportunities to acquire and accumulate knowledge, which form part of the basis of their design expertise.

6.4. Limitations of the Study

In this section, I present some limitations of this study. First, there are limitations in the design of the study. This study relied on interviews as the primary data source. Hence, designers' descriptions of their design practice regarding their personal experiences may differ from what they actually did. However, other types of data sources (e.g., design documents, system screenshots and prototypes) were used to verify and extend the interview data, and thus to increase the reliability of the evidence from interviews.

Second, cases in this study were selected from the design industry, so designers were not permitted to share some of their project documents, which might have helped to understand and triangulate the interview data. Even in the interviews, designers could only talk about the design work that was not commercially confidential. So this limitation also affected the understanding of the actual design practice. However, there are unfortunately no methodological ways to solve these problems.

Third, there were other interaction designers involved in each case. They may also have used their personal experiences in the projects, but their practices may reject the patterns I found in this study. And they may have different evaluations about the design decisions made on the personal experiences of the interviewed designers (who used their personal experiences in the cases). Therefore, further research should be conducted. Despite this, what I have presented in the case study results can guide future exploration.

A final limitation relates to the case study approach this study adopts. It is inherently limited to “analytic generalization” (Yin, 2009, p.43), as opposed to “statistical generalization” (ibid). But this approach could allow me to explore the research topic in depth.

6.5. Summary

In this chapter I have summarized the role of designers’ personal experiences in interaction design practice by outlining the research results in both existing work on designers’ personal experiences and this study. Also, based upon the findings of this study, I argue there is a need to explicitly recognize the legitimacy of designers’ personal experiences in interaction design practice. In addition, I have discussed the implications of the findings for interaction design from the following three perspectives:

- **Design management.** The *authority and opportunity pattern* indicates that in an interaction design project designers’ degree of authority in making design decisions was relevant to the opportunities that they could have to apply their personal experiences to their design work. Therefore, a project manager, a lead designer, and a designer involved in a design project should consciously take different actions to take advantage of their personal experiences intelligently.
- **User-centered design.** Some researchers argue that a user-centered design approach does not focus on design. So there is a gap between using a user-centered design approach and the generation of design ideas. The patterns uncovered in this study imply designers’ personal experiences were a source for design ideas. So this suggests that the approach of incorporating designers’ personal experiences into design practice could help address the drawbacks of a user-centered design approach in certain contexts.
- **Design education.** The findings of this study imply that interpretation and judgment are the basis for designers’ use of their personal experiences.

Therefore, it is important for design students to develop three kinds of skills in order to effectively work with their personal experiences in their design practice. These three skills are sensitivity to personal experiences, interpretation, and judgment.

7. Conclusion

'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' subject feelings and thoughts while interacting with digital artefacts. However, as both the creators of such digital artefacts and 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. Most existing design research on designers focuses on their cognitive activities in design thinking process and the design tools that they use for technology design (Chapter 2).

In order to uncover interaction design practice relevant to designers' personal experiences, this thesis undertook a descriptive and multiple case studies approach to explore interaction designers' actual manipulation of their personal experiences in three industrial interaction design projects (Chapter 3). In each case, the design work of two interaction designers (one was the design leader of the project and the other one was an interaction designer who was highly involved in the design of the systems) was studied by collecting and analyzing evidence from multiple data sources (Chapter 4). The findings of the three case studies illustrated that designers applied diverse personal experiences to different aspects of interaction design practice (Chapter 5). A discussion of these findings demonstrated that this study has several important implications for interaction design; for example, the findings imply suggestions about the actions that different stakeholders involved in a design team can take to intelligently take advantage of their personal experiences for their projects (Chapter 6).

This chapter will first revisit the research questions of this study, then present its research contributions and finally outline four directions for future research.

7.1. Revisiting Research Questions

This study focused on the interaction design practice related to designers' personal experiences. It presented two research questions to define the scope and guide the research approach. Nine patterns describing different aspects of designers' use of their personal experiences were generated in data analysis. For each research question, a summary of its pertinent patterns is presented below. Table 13 presented in chapter 5 also maps such patterns with the research questions they could address.

- **Research Question 1:**
How are interaction designers' personal experiences incorporated into interaction design practice?

This question was addressed by several patterns. First, on the subunit level, *high-level design pattern* and *detailed-level design pattern* demonstrate that designers had different perceptions when they worked with their personal experiences. Specifically, as the patterns' names suggest: designers whose job was related to high-level design (such as figuring out features or components of software, making decisions about when and where to do research, and creating design goals) felt confident to use their personal experiences. Designers whose job was relevant to detailed-level design (such as designing wireframe and interaction flow of a product, doing visual design for an interface) used their personal experiences in a spontaneous and intuitive way.

In addition, *authority and opportunity pattern* shows how the opportunity that designers could have to use their personal experiences varied in a design team. The more authority designers have in design decision-making, the more chances they could have to use their personal experiences. Moreover, *communication pattern* indicates that designers' use of their personal experiences was an individual activity. Designers hesitated to share their personal experiences with their team members and chose to communicate the design decisions or design judgments made on the basis of such personal experiences. Also findings show that the ways in which designers communicated their design decisions or design judgments varied. Finally, *responsibility pattern* reveals the reasons that designers exploited their personal experiences were relevant to their responsibilities in a project.

Second, on the case level, *commercial business project pattern* and *exploratory research project pattern* show that the type of a project was relevant to the ways designers used to apply their personal experiences to their design work. In a commercial business project, designers' personal experiences of contemporary products were utilized more frequently. In an exploratory project, designers took advantage of various personal experiences for different design work. However, *understanding user needs pattern* indicates that no matter what kind of project, designers' personal experiences could be used for understanding user needs, just as the pattern name suggests.

- **Research Question 2:**
What is the role of interaction designers' personal experiences in interaction design practice?

This question was also addressed by several patterns. Most of them have been mentioned above, because such patterns could apply to both research questions. But it is still necessary to explain how they address this question.

First, both *using contemporary products pattern* and *commercial business project pattern* show that personal experiences of contemporary technologies in the market was vital for a designer's job, especially in the context of a commercial interaction project, as such experience is a source for both design ideas and design insights about technology design. Second, *responsibility pattern* indicates that the specific role of a designer's personal experience used in a project was relevant to the designer's responsibilities in the project. Third, *exploratory research project pattern* demonstrates that in an exploratory project, designers' personal experiences were used for various tasks, so the roles they played in the project were also multiple. Finally, *understanding user needs pattern* describes how designers' personal experiences were considered as a lens for seeking essential user needs in both commercial and research projects.

In conclusion, in the three particular cases, the roles of designers' personal experiences are as follows:

- A lens for seeking essential user needs;
- A source for design ideas and design insights;
- A basis for decision making;
- An enlightening source for applying a design technique.

7.2. Contributions of the Study

Although this study was not extensive enough to understand the full scope of interaction design practice relevant to designers' personal experiences, it still presents several important research contributions.

First, it demonstrates how interaction designers' personal experiences were incorporated into interaction design practice. It differs from previous research on interaction design practice, which mainly focused on presenting design processes, design tools, design materials, design strategies/techniques, and design thinking that design practitioners adopt. Thus, the findings of this study have brought some hidden parts of interaction design practice to light and can enlarge people's view on interaction design practice.

Second, the findings of the study shed light on the benefits and different roles designers' personal experiences serve in interaction design practice, which complement the existing research on designers' personal experiences.

Third, based on the findings of this study, I argue there is a need to explicitly acknowledge the legitimacy of using designers' personal experiences in interaction design practice, because this activity would possibly enable more designers to share their design work which is related to their personal experiences. Additionally, more research would likely be carried out to help fully analyze the possibilities and limitations of using designers' personal experiences in interaction design practice which would provide designers with guidelines for better applying their personal experiences in their own work.

Apart from this, the findings of this study have other important implications for interaction design. I have detailed these implications for three areas—design management, user-centered design, and design education – in section 6.3 in Chapter 6.

7.3. Future Work

There are several directions for extending this work. First, it would be worthwhile to continue this work and involve more stakeholders in each case study. Take Case A for example; there are four interaction designers in the design team, but only two of them have been interviewed. The other two designers' design practice and their opinions about the design judgments made based on Designer 1's personal experiences are also important and valuable, and should be studied. Then a holistic understanding about the design practice towards designers' personal experiences in this particular case could possibly be achieved.

Second, because this work explored interaction design practice that occurred in industry and a number of technology design projects have been carried out by practitioners in academic settings, future work could compare and contrast interaction designers' opinions and practices regarding using their personal experiences from both settings. This would allow for a more comprehensive view of how designers' personal experiences can serve technology design in order to build a theoretical framework to describe such practices.

Third, since this work depended on in-depth interviews as the primary data source, it was hard for the researcher to ascertain if designers truly described their design practice regarding their personal experiences. So in future work, the researcher should go into the field, participate in different interaction design projects, and use first-person research to experience, record and analyze what actually happens with respect to designers' personal experiences in design practice, thus getting more valuable findings.

Fourth, because the findings of this study are inconclusive regarding the circumstances where designers' personal experiences could be a useful design source, more interaction design projects should be studied, thus providing designers with such appropriate suggestions.

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Appendices

Appendix A.

An Example of In-depth Interview Transcript

Case A

Participant: Designer 1 (P)

Facilitator: Xiao Zhang (R)

Date: 20120108

R: #00:00:36-1# in this study, I try to explore the role of designers' personal life experience in their design practice. And designers' personal life experience refers to what happened in their past life, their experience with designed products no matter digital or not, or their interaction with other people and surroundings. And experiences include like your traveling in a foreign country or your experience of using iPhone. And this experience may influence your design work.

P: #00:01:53-0# ok.

R: #00:01:53-2# Can you first briefly introduce [the name of the company]?

P: #00:02:00-7# So [the name of the company] is an enterprise software company that they do large business to business installations, and have technologies to support any kind of business in all aspects and facets of a business, so that includes HR reporting, procurement, and any kind of business, they have software that supports that, and if they don't have, they build and customize it. So [the name of the company] has hundreds of customers and they have been in business for about 40 years.

R: #00:02:51-9# what's your job position? What's the title of your job?

P: #00:02:54-9# Currently, right now, I am the design lead for the team.

R: #00:03:01-2# so what's the name of the team

P: #00:03:04-4# It's the user experience team responsible for [the name of the company] [the name of the product].

R: #00:03:10-1# so what's the routine of your job?

P: #00:03:14-2# the routine of my job. So it's obviously multifaceted, so many, many aspects to my job, I spent a lot time working with my team of designers on individual design problems, so I have a team about 6, sometimes 7 UI developers and designers, like 2 UI developers and I have between 4 and 5 designers, one of those designers is a visual designer, and then the rest are interaction designers. So each one of those designers is responsible for a certain aspect of the user experience.

R: #00:04:01-1# Yes.

P: #00:04:02-5# The UI developers for instance, are responsible for building the user interface of the software in conjunction with the engineers, and so the engineers typically like to work on and focus on large complex problems that happen on the backend of the software. We call the UI developers UI developers because they are responsible for coding the user interface, which is, specialize skill set and has different sort of approach to problem solving and doing the work. They are much more focused on quality, aesthetics, performance on the front end, and just generate the user experience as suppose to the engineers who are responsible for coding, you know performance in scalability and robust in security and these backend technology, so those UI developers do that. Visual designers on my team are responsible for the form of the product, what it looks like, color palette, grid and spacing, font choices, graphic visual design elements,

iconography, brand, brand management around the software, making sure the software follows the standard brand guideline that come from [the name of the company] global. And then the interaction designers are responsible for workflows and actual affordances in functionality, the user experience of using certain workflows and affordances and functionality within the product. I also do a little bit of visual design. So anyways, those 3 aspects of user experience have to be held together into one kind of holistic user experience, right? So that's kind of the lens I look through and I 'm responsible for looking at where problems are within the existing product and making enhancements and improvements to fix those problems, but also implementing and integrating new features into the product. And so the new features come from product owners, so there is a team of product owners who responsible for managing the business side of and product decision side of putting the product out of the door, and they decide what features go in the product, when those features go in the product, and how we get to, you know, certain releases, we have releases that come out every 3 months, and so for each release cycle, the product owners decide which features we are gonna build and put into the praetor what changes or improvements we are gonna make to the product, and then I work with those product owners and support for decision making around that, but also help them with the design of the form and behavior of those features, so that's product owners. And I also work with engineers, and we work together to, once we have decided what we gonna build, we work together to first of all decide if it's possible to build what we want to build in the time that we have. And secondly, how best to build it, so we put together designs and we hand off those designs as specifications, which are then given to the engineers, and the engineers go and build it, so there is that aspect to my job as well. I also responsible for doing evaluation of the product, so usability testing. So I work with usability professional and we plan and execute on studies and testing of the product to get a sense of where problems are for the user. And then we deliver those tests to typically 10-12 users for study, and then we organize and formulate a final report about the findings from the testing, sometimes, we do that in a more formal way, other times it is very casual and very quick, because we want to do moving so fast, so that's the valuation work I do. And the other thing I do is we hast and use design research, we sit down and we conducting interviews with users and customers.

R: #00:08:48-8# ok.

P: #00:08:49-0# so there is an important difference between users and customers. Customers are typically responsible for purchasing software; users are responsible for using software or the use in their day-to-day work. And so that's different when you are dealing with business.

P: #00:09:05-0# Do you have a question?

R: #00:09:07-0# Yes I have a question, what's the difference between users and customers?

P: #00:09:22-5# what's the difference between users and customers? Ok, sometimes, I talk about them as users VS. Choosers. There is a difference between users and choosers, so [the name of the company] build software that really, really big companies use. Like for instance, Boeing, they built airplanes, and they use [the name of the company] software, right? So the person, who's responsible for buying software for Boeing, right, is not the same person who uses this software, right? So just like your parents will buy you school supplies, they don't use school supplies, you use them, right? So your parents don't really, totally, always know exactly what you need unless you tell them, but that doesn't always happen, right? So same thing happens in big business, where the choosers will look through a certain lens when they comes to purchasing software, and they have certain things that they are interested in, is it cost-effective? Does it work with our existing software, right? Things like that. And users are more interested in can I use this in a very simple and easy way? Is it intuitive? Can I get my work done? Does it require me to learn a whole bunch of new stuff, right? And that's important to understand the difference.

R: #00:10:41-5# ok, my second question is why the new features of the product came from product owners?

P: #00:10:50-2# Well, the product owners are responsible for the business case behind making product decisions, right? So for instance, let's use a different example, let's use cars, let's say I am a product owner for Toyota, and 15 years ago, I realized fuel-cost and oil is just start to really go up, so I think it will be good if we built an electric car, so here is why we should build that electric car, here is the market requirements and the market need, we done a bunch of research to show that oil-cost are gonna go up significantly, and no one else is building electric cars right now, we think if we get an early start on this, we will be a market leader and people will like Toyota more, and wanna buy more Toyota products cause they are being innovated, right? So then once that decision is made, then you go to the designers and say, right, how do we build an electric car? Right? So the same person doesn't do that work because this is different expertise, right? So this product owner has probably looks more through business lenses, what are the margins? How much money can we make if we have all these parts be pulled together, can we sell it at a price point that people wanna buy? And designers are more interested in things like materials and is it intuitive and easy to use, do users understand that if they push the button to start the car and not turn the key, and you are completely different skill sets, completely different responsibilities and basically comes down to the division of labor, and so yeah.

R: #00:12:44-8# I think you said you also do the user testing, so if the findings from the user testing, you also can figure out the new features you need to add to the product.

P: #00:12:58-0# So, the product owners rely on a close relationship to myself and my team because, you know, we inform them and say, Well, you know, it's probably a good idea to still have a key for the car, right? Because it's a model that users are used to, right? So just have a button is a bad idea, so then they decide, Ok, well, then that's something we need to design, we need to design, this is something that's part of the product offering, it comes with a key, right? And that's something that comes out of user testing or user experience, we work together on that, and a product owner who may not be thinking about that kind of stuff, wouldn't think that we need to design and build the key, they just want the button, right? So we worked together and there is always overlap.

P: #00:13:52-0# Does that make sense?

R: #00:13:52-1# Yeah, so what do you think about interaction design practice?

P: #00:14:04-3# what do I think about it? That's pretty broad question, I think you need to narrow it down. I mean I can say, oh I like it, or I can say, you know, this is what I do everyday.

R: #00:14:51-2# so what are the differences between your practice and what you have learnt from school?

P: #00:14:59-2# Oh, ok, I think I understand now. Well, they are significantly different, you know, when I studied interaction design, it was extremely theoretical, I was fortunate enough to work on a lot of projects that were very broad in scope, and weren't require to think about the business case, and weren't require to think about constraints such as time and money, and there is more just about being creative. It's fine to be creative, but really, creativity only goes so far in the real world, and this is the difference between creativity and innovation, is that you could be creative and built something that's really cool and different, but nobody will buy it, right? It is just different for the sake of being different and oh, isn't that creative? Isn't that clever? But no one buys it, right? And the difference between that and innovation is you built something that is creative and clever and everyone wants it, right? So, I think in the real world, innovation is far more important and it is a fundamental difference between school and my daily professional practice, is that the innovation imperative is much more pronounced. You have to build something that people will pay for it, and that really is what comes down to and something that's really hard for designers when they come out of school, is if they spent their whole academic career just being creative, that's a real difficult transition, because business and money runs the world, unless you are working for a nonprofit or you know, you want to take your design practice in a very particular kind of direction, you ended up having to very seriously think about how you make some money off for

this. And so, when it comes down to that, it takes a while to get used to that lens and to get good at that lens, right? And so, I think that's the biggest difference.

R: #00:17:29-2# Yes, that's a clever point. So what the role of interaction designer in [the name of the company]?

P: #00:17:52-8# Ok, so what's the role of interaction designers in [the name of the company]?

P: #00:17:59-9# Well, they are positioned within the user experience group. First of all, they are responsible for designing the behavior of features in our software, sometimes they are also responsible for designing the form, but less so at [the name of the company], because the form is already established and determined by the global group, so basically the interaction designers, most of the interaction designers in [the name of the company], get a handful crayons that are allowed to use, right? Because and what those crayons look like and how they are defined by the global group, so they have to use those crayons to build all the feature. So if you use Microsoft products, they all look and feel the same. So, it's not different every time. So you have to follow what is basically a standardize collection of patterns and user Interface, widgets to build out a feature. And the product that I'm working on, because it's coming from the labs, and [the name of the company] is more focused on innovation, so we haven't followed any strict standards yet, but that's happening and coming soon. Within the next year, we will start to take, because the product is been starting to be successful in the market, then we have to bring it in line with standard way that [the name of the company] product look and feel. So, anyways, that's what interaction designers do and they work with product owners and they define the behavior of features that are going into new products, they also responsible for evaluating the user experience of existing features in our products and trying to improve them through enhancements.

R: #00:19:51-6# So what was the common design process your design team explored in design the software, so do you have a common design process or you don't have design process?

P: #00:20:06-0# we do have a design process. But again it depends on how you want me to answer that question, right? We have phases that we go through, and I can talk about that. Or I can talk about how an interaction designer sits down and works on a problem. How would you like me to answer?

R: #00:20:26-7# I think I prefer to know how the group does it.

P: #00:20:32-8# so basically, we built the products in sprints. We call it sprints, because we use an agile process. So we have 4-weeks sprints, and we have 3 sprint releases, so every 3 months, we release a new version of the product. For each sprint, we sit down and we talk to the product owners and engineers and we say what we wanna do in this sprint. And we say well, we wanna use a different analogy, we wanna make, say, we are making food instead of software, right? Well, we would say we are gonna make lasagna, and a salad, and some salad dressing, right? And so, somebody agrees, ok and then the engineers would say, what kind of lasagna? Because we only have these ingredients, we don't have any meat. All we have is vegetable. Ok, so we are making vegetable lasagna. Ok, everybody agree on that? Yes. Ok, what kinda salad? Well, let's use Caesar salad. Ok, well then, that tells what kinda salad dressing we need. We need Caesar salad dressing. So everybody agrees. And that period where you just kinda talking about what you wanna build that sprint. That's called the inception. And so basically then what we do is the designers, they take that and they go away, and they start to draw sketches, and they come back to the product owners, and they say, is this what you had in mind when you through about the Caesar salad? And the product owner says, yeah, but I don't like the croutons of purple. Can you just get regular color for croutons? Yes, no problem, so we will go away and then come back and say, is this what you think? And they say yes. Ok, good. So then we sign off on that. And then we take that to the engineers, and the next phase is called elaboration. And we say, right, this is what it needs to look like. It needs to have green lettuce and amazon cheese and these are the croutons that are ground. And it needs to have this amount of salad dressing on it, and not too much and not too little, right? And the engineers go, Ok, what about this and what about that?

Can the salad dressing be purple? No! Has to be white, right? Ok, ok, what we can do what. Well, can we do base? Well, yeah, sort of. Ok, what do you mean sort of? Well, its kind of beige blue. Ok, well, that's not gonna work. Ok, then we can't do that. Ok, then what kinda salad is it? Well it's not really a Caesar salad; it's got a blue dressing on it. So then what is it? Well, it's kinda parched. Can you just do the salad without the dressing this time? So we can do the white dressing? Yes, we can! Ok, so let's do that. And then just understand that, we are gonna have to tell the people who are coming over for dinner, or who are gonna buy your software. That it's a salad without any dressing on it. Well they are not gonna like that. Well yeah, I know, but that's all we can do. Ok, so when can we have the salad with the dressing on it? Well, we can have that in 2 months. Ok, so let's hold on and serving the salad for 2 months then. Ok, that's called elaboration. And so, there is inception, which is like everybody just agrees, then we get into the details and look at constraint, right? And that's that whole thing and then get real or scope of what we can or can't do. And sometimes, we have to push out certain features because we can't do them in the time we have. So then once everybody agrees, then they go off, and the interaction designers work on that first piece which is building the salad, and what that's gonna look like. And they hand that picture to the engineers, and the engineers build it, and then the engineers come back and say, ok, here is what I built, and then product owners and designers on my team will sit down and look at them and go, well, it kinda doesn't really totally look at what we had hoped it is gonna look like. That picture we drew for you, this doesn't look like that. And then the engineers go, well, I don't have enough time to make it look like that. And they say, ok, well, how close can you get it? So then they tweak it a little bit, and that's called construction where they are actually building it, right? And then we have a final phase which is called stabilization, so that's point that it's actually built and delivered, and so they come, the engineers come to give us the salad, give the product owners salad, the engineers, the designers design the salad and we eat the salad, and we say, this's pretty good or it needs a little bit more of this, so a little bit more of that, and that's called stabilization and QA, or a quality assurance, right? So the engineers stabilize and we do quality assurance, and then we make a little tiny change, and then we release.

R: #00:25:28-2# so because every three months, you launch a new version. So is there a big difference between the 2 versions?

P: #00:25:41-9# Sometimes, it's a really big difference, but sometimes it's smaller. It depends how complicated the feature is we are trying to do right, like last year, we created an entirely new landing page for the product, which was more like Google+, right, then just a list of work spaces, and so it had a feed, and it had, you know, people you should follow, and all these social computing affordances were built into the product in the last year, so this is a significant difference until what it was, and so at some point, you have to release those and so you make big change, and follow that with a sprint, which is about cleaning that big changing, making small changes and stuff like that. So we probably get 2 big changes and 2 small releases.

R: #00:26:37-3# Ok. So this project is always going on?

P: #00:26:39-2# Constantly.

R: #00:26:48-2# So based on your design practice, do you think your personal life experiences are one kind of potential factors that can help or influence you in design practice?

P: #00:26:56-6# Yes.

R: #00:26:57-1# Can you give an example?

P: #00:27:07-4# so first of all, I will say this that...

R: #00:27:13-5# You can first talk about what your project is or what are the features of the software, and you can talk about what the experience is. So what experiences influence your design of the features?

P: #00:27:29-5# Sure, ok, one of the things we built in the [the name of the product] is a place where people could go in and collaborate around doing work with other people. It's a collaborative

work tool. And so you may have a business situation that becomes up, and you and me and Leah need to get together to work on that business situation. So we create this work container, and all of our documents go in, and that is where you go in and you do your work, right? So that's what we are asking our users to do with this tool. So my day-to-day experience working at [the name of the company], I spend most of my time communicating in doing work in two ways: the question is how do I currently do this kind of work, right? Is a really important lens for me, right? So I did it in two ways: I sit in meetings, right? And sometimes I have those meetings face-to-face or over the phone or I use email, right? So that's how I currently do my job, right? When I have to collaborate with other people. So we've built this tool that we are asking people to go in and do their work in this new tool, right? The [the name of the product]. So we built [the name of the product], and we want people to go use that to do collaborative work. Right? Well, the problem is that I am already doing my work in a certain kind of way, and most people are, most people do their work with emails and meetings. So when we think about how [the name of the product] should be designed, well it's really important that it works really easily with Email, right? Because that's where all this work is happening for me right now, and I am just not gonna stop doing email, right? So, I need, if you are gonna ask me to use the new tool, it better work really well with the tools I already use, right? And so this is something I am very aware as the design lead for product, right? And so I am constantly advocating and in discussions with the product owners about meeting to make [the name of the product] work better with email, right? Because my personal experience is that, and I 'm also the advocate for the user is that I am already using email, so the more it works with email, and easier it is to move back and forth, the more likely the users are gonna adopt it, right? So every day, that I am using email, and I am doing work and all my work is constantly collaborative, right? I am thinking and looking for points of friction between email and [the name of the product]. Right? 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 of using it. My personal life experience drives about 95% of my current awareness of what [the name of the product] needs to do and how I need to behave, because the product needs to get to a certain point where it's just easy to use, and then once we do that, we can customize it so that it can fit into all these unique situations, but there is features that what I will call hygiene features. And a hygiene feature is this. The reason is called hygiene, is because if somebody has good hygiene, right? Do you know what hygiene is? Hygiene is, like for instance, you and myself and Leah, we have a shower every day, and we brush our teeth, right? We use soap, we wear clean clothes, and we wash our hair, right? And so we have good hygiene, we keep ourselves clean, we don't stink, we don't bad breath, right? And we are not dirty, right? But we all met people who don't have good hygiene, right? They don't brush their teeth, hairs are greasy, and their clothes are dirty, right? They might smell...right? So they had bad hygiene. If someone has good hygiene, it's just expected, right? In society, it's expected that you will shower on a regular basis and you will show up to meetings and not stink, right? And so if you have good hygiene, we don't go around and say, oh, congratulations, Xiao, you are clean, right? Because it's just expected, right? Where becomes problem is when it's not there. So when somebody stinks or smells, then everyone is aware of that, but if they don't stink or smell, no one is aware of it, because it's just expected. So that's called the hygiene factor. And you can look through that lens for software, so search is sometimes considered the hygiene feature, is that when it's there, it's like, ok, yeah, I would expect it to be there, right? But if it's not there, it's a problem, right? So right now we are at the stage with [the name of the product] where there are a lot of hygiene features, that aren't in it yet. And so I don't need to go to do user research to understand those features needed in the product. I can just from my own personal experience to understand that those features need to be in the product. So I can just pay attention to how I do things and how I would use certain tools and represent the user through my own personal experience. So yeah, I would say that at this stage, the product hasn't mature enough that we have covered all the hygiene features and so I would say 90% of my design thinking happens as a result of my personal experience and my teams' personal experience.

R: #00:33:58-4# How does [the name of the product] support sitting in a meeting?

P: #00:34:20-1# There is a bunch of different ways that we looked at. First of all, if you're in a meeting with people, and they are not co-located with you, they are not in the same room with you, they can, one is in Japan, and one is in Vancouver, you need to be able to see the same thing and talk on the phone, right? So we'd like, we are currently looking at how could we make it easy to do that with [the name of the product] so that you can both log into the [the name of the product] the same time, and you can do your work when you are not together in the same room, but you are collaborating remotely.

R: #00:35:00-6# so they can also use [the name of the product] and talk with each other, and they can, on the same page of the screen.

P: #00:35:10-1# so you are here in Japan. And I am in Vancouver. We will meet in an activity in [the name of the product], right? And we'll talk about what we wanna do and take notes, and you can see those notes, and so can I, just like being in a meeting.

R: #00:35:23-4# so this is like Google Docs.

P: #00:35:27-7# Similar to Google Docs. That's just one feature, right? I can't talk about other features because we are still building it, right? But there is a lot of work that we are doing to try to make [the name of the product] work well with meetings.

R: #00:35:43-6# Ok, but this is a great example. Because your example is [the name of the product], so the rest of the questions are about [the name of the product].

P: #00:36:12-6# I should probably say this that when you write your thesis, you cannot be able to mention [the name of the company] or [the name of the product]. You need to say this software product, you can talk about it being a collaboration tool, and you can talk about [the name of the company] being a larger enterprise software company. We need to move that stuff.

R: #00:36:34-1# Ok, ok. And thank you for reminding me of that. So [the name of the product] is really a big project, how many people are involved in this project?

P: #00:36:50-3# I think there is about 50 people.

R: #00:37:03-2# so how much did you influence the design results of different versions of [the name of the product]?

P: #00:37:20-1# Significantly...Yeah, so significantly, I would say there has probably been about 4 significantly different versions of [the name of the product]. So like version 1, and it had like a collection of functions, right? And version 2 had more advance functionality, and version 3. And then right now we are in about version 4. So I would say significantly I have been involved in every single one of those versions. Version 3 and version 4, I was the design lead and so I was very significantly involved in what those look like, but prior to that, version 1 and 2, I was on the team still, but I wasn't the lead.

P: #00:38:54-0# so because you are the design lead of version 3 and version 4. So in the design practice, a product owner told you what should be included in the new version, and then the visual designer and interaction design sketch the conceptual development for the new version. So is the interaction designer, they propose their ideas and then you will determine which design is the best, and you will give feedback for them?

P: #00:39:35-9# Yeah, so the product owners, we collaborate very closely. And for version 3 and version 4, they obviously made decisions about the general feature set that we should have in those versions. But I was responsible for making decisions in addition to my team. My team was responsible, my team and myself. For a significant portion of what the product look like, and how it will be felt, and how those features came together. So yeah, is that answer your question?

R: #00:40:23-9# Yes. So how do you think your personal life experiences can contribute to your creativity in your design practice?

P: #00:40:53-5# Well, I think it's important given my role that I spent as much time as possible

using other tools, but also reading and researching contemporary trends in software development and understanding the opportunities. That's a really big part of my job is trying to stay up to date before it's happening in the industry. Particularly because I 'm responsible for innovations, so we have to think about what the next thing is, so we always have to be thinking ahead. So it's important that I 'm using contemporary tools all the time, so for instance, I have the latest iPad, I have the latest iPhone, but I also have access to Android and windows phone 7 mobile technologies. Mobile is a really important direction for us as a company, it's a huge massive technology paradigm shift, so I need to be using mobile tools all the times so that I'm familiar with what are the opportunities and also the issues, and barriers. And so through that usage, I understand through my personal experience, how we can apply certain ideas to our own products, and it's something that designers are always doing, and in that way, I am always working, always, always working, I am always paying attention to everything and all the technologies I am using, I'm reading blogs and making sure I got the latest version of this or that software, and it is just a part of the job, is you have to keep your thumb on the pulse of technology, so and without that, you end up becoming, you know, out of the loop if you will a little bit your skill set becomes antiquated, because if you wanna work in technology, you have to be careful that new technology doesn't deskill you, right? So a perfect example is Flash, Flash is something that's no longer relevant, it's completely in the last year two years falling off and html5 is the new standard, right? So I need to understand html5, working with it, I have to be nearly a doctor so that I can get my job done.

R: #00:43:34-8# Do you have other examples that you incorporated your experiences of iPhone or iPad into your own design?

P: #00:43:51-9# that's a difficult question to answer. Mostly because there is all kinds of patterns issues that come, like if I was to say in sale, oh I use this app, and then it inform this feature in our app. That could get me in legal trouble. So, I can't really talk about that. I can't give you explicit examples. It's just...I can tell you this, right? Like for instance, Facebook, right? Everyone uses Facebook, right? And I occasionally use it as well, because I need to understand what the experience of using and reading a news feed is like, right? Where you have constant events coming in, right? And updates, and that approach to consuming information is become a pattern in our world, and I need to understand what is like to consume all that information, right? it's overwhelming, right? And so it's a kind of fire holes. And one of the big challenges from a user experience perspective around that kind of experience is giving users that handles to filter the information, so that they can just focus on the thing that they are interested in, right? So I am constantly using different examples of feeds, where it called news feed, right? As well as observing different approaches to filtering feeds, to try to come up with the strategy for our own product that uses feeds. How about that, is that a good example?

R: #00:45:38-6# Yeah, it's really good. Ok, I think we are done.

Case A

Participant: Designer 1 (P)

Facilitator: Xiao Zhang (R)

Date: 20120414

R: #00:01:06-5# in our last interview, you talked about how you incorporated your experience with email and meetings into [the name of the product]. So how did you communicate your experience, or how did you communicate your idea with your team member, other interaction designer and the product owner?

P: #00:01:14-5# we spend time talking about what we gonna (can) do next for the product and those discussions are had different stakeholders. So for instance, I will talk to the product owners and we will talk about where, what I would call the points of friction are with the product. Where

are their problems with the product right now? What would make it easier in use the product? And because we used the tool for our own work, we are always looking through the lens of how could we make this easier for us. So we have meetings to talk about what we gonna build next because we had this spring model, and during those meetings, we will talk about our own experiences with the product and, because everybody uses email, and everybody has meetings. It's easy for everybody to talk about how the tool can support those contexts. Everyone is familiar with what is like to do that kinda work and everybody is also familiar with the tool we are trying to build. So what we will do is we talk, and it's just simple conversation, and some people will have different perspective, other people will agree. And then based on those conversations, we take our designs to the next levels. So we will decide, ok, now, we are going to do X feature, and then we will sit down and do some sketches. But as far as communicating, my interest in using email whatever tool, and having meetings with whatever tool, most is just in a conversation, in a meeting.

R: #00:03:15-7# so how did other stakeholders in the meeting justify and evaluate this experience and this idea and this feature?

P: #00:03:25-5# I think it's just, it's a same thing, you know, you just use the tool, and using the tool, you recognize that it is complicated to try to get an email or your email client steak it in extreme, it takes too many steps, and we are also busy that when something isn't convenient, and something isn't intuitive, just doesn't happen. So to justify it, they just, I guess it's about a common standard that they have some similar experiences as I do. And so, because they have their experiences as well, they relate to the comment and assign it via some giving. And because they relate to it, the whole active justifying it, is just not really needed. So there is no formal justification process beyond, or I agree or I disagree that I haven't have that experiences, or yes I did have that experiences, therefore I agree.

R: #00:04:29-0# so you also said some people may don't agree with this idea, so what are their points? And why they didn't agree?

P: #00:04:42-4# Well, there is a lots of different reasons, right? I think depends on values and also you are responsible for on the team, so we require a lot of the engineers and they had different responsibilities. They got paid to do different kinda job than I got paid to do. And so they are interested in making sure the product performs well and stable, and you know, this kinds of things. It's not part of their job to worry about the users necessarily even though it is everybody's job to do that. I think that also based on their training; they will evaluate a work situation or their work. What I find is depending on how someone is being trained, whether it's going to school or you know through experience. They will think about dime in a different way, what is dime look like? Right? What is the finishing thing we were trying to achieve look like? And so I don't think that convenience and intuitive features are necessarily that important to an engineer when he thinks about what dime looks like. It's more you know, like, does it stable? Does it perform well? These kinda things. So I think part of the reason why they don't necessarily... They may agree that it will be good to have the feature that I am trying to convince people to build, but they may not see it as a priority. And so there is that side as well, is that people's priority is different. So that's really what it comes down to, is priorities and also what are they think, you know, their particular value set, as professional value set.

R: #00:06:50-7# You said in meetings, you talked with product owners about what features should go into [the name of the product], so How did your team add this experience into the design decisions?

P: #00:07:47-6# Well, there is different important lenses that we look through. One is customers, so the customers have said that they want X feature, then we often will build it. If user experience says, we wanna invest in some certain kinda feature, it's typically that we need more than just our opinion. We need to make a really strong case for it. And so we will do perhaps supported with usability testing, perhaps will supported with a prototype to show how much better it would be. Perhaps we will spend a lot time with product management and argue why we are thinking it's

important? And other being factor in picking the design features we are gonna build is whether our VP agrees it or not? So we have a vice president of engineering, and he has a very strong voice in determining what we build. If he agrees, then no one disagrees. So we have senior executives who have a very strong hand in determining what we build and what we don't build. So if I want something build in the product, I will sometimes go to him, and I will talk to him and 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.

R: #00:09:45-7# so how did you communicate your experience or idea with the interaction designers in your team?

P: #00:10:16-0# Very similar to how we will communicate to product owner. Often, it's easier to communicate an idea with the picture. So if I have an idea of how to improve the product. I will do what I call, a sketch or a mockup, and then I will explain it to the interaction designer. And the interaction designer will ask questions and I will answer those questions. We will often in this, this is an important step. We will spend a lot of time arguing, not arguing, but discussing why we should do something? But it's also really useful to try to flip that upside down, and say, ok, why shouldn't we do this? This is an important question when you are thinking about design, why should we not do this? And what that does is even we all think we should do it, by asking the question why shouldn't we do it. We force ourselves to think about the negatives, you understand what I am saying there? So I will be sitting with 3 interaction designers, and I will say why shouldn't we do this, and allow this does that. But as far as the active communicating a feature, it really is mostly with a sketch and a verbal discussion.

R: #00:11:54-3# so I'd like to know, who was responsible for implementing the emails and the meetings?

P: #00:12:22-5# I think me, [the name of Designer 2],

R: #00:12:36-9# Last question, what is dominant design approach or design principle that guides this project?

P: #00:13:01-6# Right, I think I know. So what are the design principles? Ok, so there is one principle, which we call, nearness, so it's near I mean. So when we talk about asking information workers or users to adopt a new tool, it's really important that we make it as easy as possible for them to adopt it, right? And so, a big part of that is, does it work with the tools that I am already using? So I already use email, I already have meetings, right? So it's gotta feel like it's close to me, like I don't have to go somewhere else to do it, right? So nearness is something we talk about a lot. And I think that there is, you can take that idea of nearness, and say, ok, what will make the product feel closer. And if it worked perfectly with email, then it will feel closer, right? So nearness is one of them. We also talk about mobile first, so sometimes we will sit down and think about a feature and design it so that it will work on a mobile device, and then that forces you to keep it simple. You know I mean. And also if you design for mobile first, it makes it easier to translate the experience to the mobile context side. I am trying to think of principles.

R: #00:15:11-2# so maybe like some design approach?

P: #00:15:18-5# Yeah, ok, so there is another one, which I will say, go fast go ugly. So the idea there is, we want to move as fast as possible and get the product in front of the user as soon as possible. And it doesn't matter if it doesn't look great because we are gonna change it anyways, right? And based on the feedback from the user, so let's get it out there fast, let's not worry about goal plating it, and get feedback as soon as possible, and then iterate. So for a big part of the period where we developed the product, we have this go-fast, go ugly approach.

R: #00:16:03-3# so is this approach that is user center design?

P: #00:16:12-3# No, I think user centered design is a, yes, iteration, and getting lots of feedback from users, is user centered. But user centered design often means you sitting down with users

and doing kinda formative usability testing. And we didn't really do that, instead, we release the product once a month, and we got feedback that way. So yeah, you would say it's user centered because the point of doing it, is that you get feedback from the user, right? As far as design principle? I think that, just trying to think a way, I think it has to... I mean we have always recognize that it has to work with existing tools that people have, so it has to work with established tools, or has to fit into the information of the user. So I think not being not destructive design, right? The solution should not destruct the user's existing workflows. So those are the 2 ideas I think. It's the non-destructive and work with the existing (college) of information. I have a couple of more than I can dig up, forgetting it, because there is 2(too) more I can't remember up on the top of my head.

R: #00:18:55-1# Do you have some design documents regarding the design principles?

P: #00:19:11-5# Yeah, I mean I have... we plan for strategy every year, and I have some slides that I put together to support that.

R: #00:19:39-0# How do you figure out these design principles that you should follow?

P: #00:20:05-5# I think there is just a general awareness that...well, let's take for instance, nearness, the reason that we embrace nearness is we recognize that people won't change how they do something unless it's easy and convenient., right? So a lot of people do the kinda work [the name of the product] is meant to do with email. So when you sit down and think to yourself, how are we gonna convince users to use our tool instead of email. Well, the first thing to be, is really convenient, right? Because email is so well established, right? And so it has to be close to the hand, I think there are other considerations, for example, there are so many digital tools in the world right now, and there is so much software that's being developed. If you expect the user to choose to use your tool, you have to be as close to them and their work as possible. So I think that's how we prioritize nearness. It's just a kind of awareness that we won't be successful unless very easy to use. Mobile first is an awareness of the changing hardware landscape for technology, and mobile is just defining the way that the future software will be consumed, right? so again, we just recognize mobile is important, and therefore, we should design with that in mind. So that really just comes down to awareness of technology turns. Go fast go ugly is, I think there is been change in how software build. In the past, we had project models, which were more about waterfall. So you will work for 2 years, and release something, and then wait another 2 years to update it, and what we found is that technology is just moving too fast, and so we have to shorten our cycles. And so in shortening our cycles, we embrace iteration more, and recognize that if we are gonna change something anyways, there is no point investing a bunch of time and making it a little pretty. And so that's where this kinda Go Fast Go Ugly approach came from. Just this recognition of a software trends are moving so fast, we need to, the way we construct software needs to change to meet that. And it's clear that the sooner we get feedback from our users and iterate the better. And I think also the best way to get feedback is not to put a sketching in front of a user, but give them something that they can actually use. And that fits into their day-to-day work already. You can get a basic feedback on a sketch, but the user has to use something, right? So therefore, you need to actually build something for them to use. I think that's for Go-fast Go Ugly one, and what was the last one?

R: #00:23:49-0# so, working with the existing tool

P: #00:23:51-3# Yeah, so our tool needs to work with existing tools, I think that's just again recognizing that people don't like to change unless there is a real need to change. And people will not use something unless it currently works with what they have right now. And also we recognize that we are building a tool people use to do work from 9 to 5, right? And they have important responsibilities, and they don't have time to waste to learning a new tool. So that's just us recognizing the nature of work of information workers.

R: #00:24:40-9# Do you have other ideas or something that related to designer's personal experience?

P: #00:24:51-1# other comments to make? I would say I think it's more common than people think. There is a lot of research of user-centered design and all that kinda stuff, right? But at the end of the day, it's our own personal experiences that we bring in consideration, we bring, the designers bring. That's the craft of design, right? And so I think personal experience drives more design decisions than people think. In fact, I would probably say, the most dominant factor in making decision about a design. And that being said, I think it's important for designers to understand that their experience isn't their user's experience, and so I think you need to supplement your perspectives with other people's perspectives. But yeah, personal experience is one of the most important things; I think it is a really good research topic.

R: #00:26:15-4# Thank you.

P: #00:26:17-0# It's not easy though.

R: #00:26:18-0# It's not easy. Because I think the HCI community they advocate the rational and objective design method and approach. But this research, designers' personal experience is very much related to the subjective design approach.

P: #00:26:38-3# Qualitative, not rational research topic.

R: #00:26:43-2# Yeah.

P: #00:26:53-5# I think there is the validity the researcher are doing, the scientific validity, right? It's kinda be, Yeah, I think based on what we valued from a scientific approach. People would have some comments to make about what you are doing, but the fact is, and this is why I really disagree with HCI approach, to thinking about humans and computers, is that experience isn't always rational. And this is the problem with HCI, right? Is that they are fundamentally computer scientists, and human experience isn't always about science. So I am a harsh critic of HCI and the way they do things.

R: #00:27:45-8# And I also think although HCI draws on the user information, the findings from ethnography study are designers' interpretation soy user information, which are relatively subjective.

P: #00:28:24-9# It's not scientific, it doesn't necessarily need to be studied in a strictly scientific way to get the value of it. I think that there is lots of value that didn't come out of research even though, even it's just that people are more aware of that this is the way that design happens, that's valuable.

R: #00:28:45-6# Yeah, and sometimes I ask if users are the important factors in the design process, where is the position of designers, who have devoted themselves, their time and energy, to the design job? And what's the role of designers?

P: #00:29:04-5# Yeah, I think the best example of personal experience driving successful design is apple, right? You know, everyone uses apple as an example, and it's kind of a little cliché, but apple doesn't do user testing, right? They are just good designers, and they build amazing products to people love to use, and so before we did was the HCI related work, we wouldn't end it up for that for sure, because as Steve Jobs always says most users don't know what they want, you have to tell them what they want, anyways.

R: #00:30:01-4# Yeah, thank you very much.

P: #00:30:01-5# you are welcome.

Appendix B.

CD: Supplementary Data File

The CD-ROM attached forms a part of this work.

Raw data files were created using iTunes player, and can be opened in the iTunes player.

Transcripts files can be opened with Adobe PDF.

Name	Location	Size
Designer 1 Interview Audio (20120108)	Raw data/ Case A/ Designer 1 20120108_interview.mp3	22.1 MB
Designer 1 Interview Transcript (20120108)	Interview transcripts/ Case A/ Designer 1 20120108_Interview transcript.pdf	134 KB
Designer 1 Interview Audio (20120414)	Raw data/ Case A/ Designer 1 20120414_Interview.mp3	14.6 MB
Designer 1 Interview Transcript (20120414)	Interview transcripts/ Case A/ Designer 1 20120414_Interview transcript.pdf	93 KB
Designer 2 Interview Audio (20120224)	Raw data/ Case A/ Designer 2 20120224_Interview.mp3	74.4 MB
Designer 2 Interview Transcript (20120224)	Interview transcripts/ Case A/ Designer 2 20120224_Interview transcript.pdf	187 KB
Designer 2 Interview Audio (20120326)	Raw data/ Case A/ Designer 2 20120326_Interview.mp3	10.1 MB
Designer 2 Interview Transcript (20120326)	Interview transcripts/ Case A/ Designer 2 20120326_Interview transcript.pdf	85 KB
Designer 2 Interview Audio (20120402)	Raw data/ Case A/ Designer 2 20120402_Interview.mp3	35.6 MB
Designer 2 Interview Transcript (20120402)	Interview transcripts/ Case A/ Designer 2 20120402_Interview transcript.pdf	149 KB
Designer 2 Interview Audio (20120421)	Raw data/ Case A/ Designer 2 20120421_Interview.mp3	26.4 MB
Designer 2 Interview Transcript (20120421)	Interview transcripts/ Case A/ Designer 2 20120421_Interview transcript.pdf	150 KB
Designer 3 Interview Audio (20120303)	Raw data/ Case B/ Designer 3 20120303_Interview.mp3	33.1 MB
Designer 3 Interview Transcript (20120303)	Interview transcripts/ Case B/ Designer 3 20120303_Interview transcript.pdf	112 KB
Designer 3 Interview Audio (20120328)	Raw data/ Case B/ Designer 3 20120328_Interview.mp3	26.9 MB
Designer 3 Interview Transcript (20120328)	Interview transcripts/ Case B/ Designer 3 20120328_Interview transcript.pdf	127 KB
Designer 3 Interview Audio (20120330)	Raw data/ Case B/ Designer 3 20120330_Interview.mp3	20.9 MB
Designer 3 Interview Transcript (20120330)	Interview transcripts/ Case B/ Designer 3 20120330_Interview transcript.pdf	86 KB
Designer 3 Interview Audio (20120402)	Raw data/ Case B/ Designer 3 20120402_Interview.mp3	28.7 MB
Designer 3 Interview Transcript (20120402)	Interview transcripts/ Case B/ Designer 3 20120402_Interview transcript.pdf	106 KB

Designer 4 Interview Audio (20120503)	Raw data/ Case B/ Designer 4 20120503_Interview.mp3	46.6 MB
Designer 4 Interview Transcript (20120503)	Interview transcripts/ Case B/ Designer 4 20120503_Interview transcript.pdf	125 KB
Designer 5 Interview Audio (20120314)	Raw data/ Case C/ Designer 5 20120314_Interview.mp3	39.4 MB
Designer 5 Interview Transcript (20120314)	Interview transcripts/ Case C/ Designer 5 20120314_Interview transcript.pdf	187 KB
Designer 5 Interview Audio (20120402)	Raw data/ Case C/ Designer 5 20120402_Interview.mp3	8.9 MB
Designer 5 Interview Transcript (20120402)	Interview transcripts/ Case C/ Designer 5 20120402_Interview transcript.pdf	75 KB
Designer 5 Interview Audio (20120426)	Raw data/ Case C/ Designer 5 20120426_Interview.mp3	19.1 MB
Designer 5 Interview Transcript (20120426)	Interview transcripts/ Case C/ Designer 5 20120426_Interview transcript.pdf	73 KB
Designer 6 Interview Audio (20120418)	Raw data/ Case C/ Designer 6 20120418_Interview.mp3	17.3 MB
Designer 6 Interview Transcript (20120418)	Interview transcripts/ Case C/ Designer 6 20120418_Interview transcript.pdf	95 KB