DESIGNER-USER INTERACTION AS THE CORE OF THE DESIGN & IT INNOVATION PROCESS: A SOCIO-CULTURAL PERSPECTIVE

Completed Research Paper

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Abstract

In this paper, a model of designer-user interaction as a socio-cultural phenomenon is proposed with the following question: how do the changes in the designer's perspective on the user's physical and social experiences lead to design refinement or design innovation sequences? Adopting Bourdieu's theory of practice as a macro view, we interpret field as rules of action, habitus as modes of action, and practice as situated actions in the design process. Particularly, this research argues that the changes in the designer's habitus, as a result of newly acquired knowledge from user research, entail innovation of practice and expansion of field. In addition, the concept of boundary object is considered how the designer's research activities assist them in acquiring knowledge from various sources, and to translate / transform it across domain boundaries during the process. Four case studies are presented as empirical evidence.

Keywords: Design and IT innovation, Innovation processes, Ethnography

Introduction

Design is an activity of '[devising] courses of action aimed at changing existing situations into preferred ones' (Simon, 1969), and designers look for opportunities to innovate from a variety of perspectives. Previous innovation research literature acknowledges the importance of knowledge transfer among all stakeholders participating in the design process (Cruickshank, 2010), because innovative solutions are generated by piecing together all existing solution ideas in a domain, assembling solution ideas across multiple domains, or migrating existing solution ideas to different domains and adapting them (Lehoux & Hivon, 2011). Hippel (1976; 1986; 1994) argued 'user-driven innovation' and the potential user of the designed artifacts is the center of the stakeholders who can contribute with various domains of knowledge in the design and innovation process. Therefore, designer-user interaction has become a central research issue in the areas of information systems development (ISD), management science, user-centered design (UCD), and participatory design (PD). With this respect, few prior scholars have demonstrated the mutual understanding between designers and users (Churchman & Schainblatt 1965) and the designer-user interaction as an effective communication process for user knowledge elicitation (Kensing & Munk-Madsen, 1993; Muller et al., 1992). Yet, the designer-user interaction research has not been documented adequately in information systems (IS) research; because the communities of ISD and design science research in IS have examined IT designers and IT users as separate research domains with particular regard to how designers can implement design artifacts, or how users can adopt the established designs as a passive stakeholder group. Also, the designer-user interaction research requires more theories, frameworks, and models to demonstrate their interactions, patterns, and sequences in the process of design and IT innovation in ISD.

In addition to the aforementioned perspective on the designer-user interaction research in IS, this study proposes an additional perspective of seeing designer-user interaction as a socio-cultural phenomenon. In other word, as socio-cultural phenomenon, designer-user interaction can reveal the different worlds to which they belong, different perspectives they bring, and how their systems of ideas will be influenced by this encounter. Particularly, in this paper, we highlight the designers' perspective as a crossing boundary action to overlap users' boundary in the process of design and IT innovation.

Traditional ISD, UCD, and PD methods have mostly sought to elicit the fairly fixed information of user's knowledge and requirements in order to succeed in design and IT innovation, because they believe an innovative product or service meets most of the information and requirements. Yet, innovation is more often a solution that overturns the users' and designers' conventional ideas of what a product/service is and how it works than just an aggregation of all solutions to known problems. Also, innovation requires more dynamic interaction than fairy fixed information sets or requirements from users. Thus, designer-user interaction involves opportunities to examine all hidden assumptions that used to be inevitable constraints but can now be overturned with new developments and technologies in the market. In the end, the designer-user interaction will expand the worlds in which they live because their ideas of the product/service can be broadened.

Starting from this proposition, we ask the following research question: how do the changes in the designer's perspective on the user's physical and social interactions lead to design refinement or design innovation sequences?

In order to address this research question, this study aims to expand the theoretical understanding of how tangible or intangible designer-user interaction leads to design and IT innovation with emphases on:

(1) As a macro view, a model of designer-user interaction that shows the two different types of design sequences, design refinement and design innovation, based on Bourdieu's Theory of Practice (Bourdieu, 1973, 1986, 1998; Bourdieu & Nice, 1997; Bourdieu & Wacquant, 2004).

(2) As a micro view, the designer actions that function as Boundary Objects (Star & Griesemer, 1989) in the process of working with users to assist transferring, translation, and transformation of knowledge (Carlile, 2004) across domains.

In this study, we propose an integrated model based on Bourdieu's Theory of Practice (the macro view) and Boundary Objects (the micro view) and demonstrate four case studies that include direct interaction with users of products/services in their organizations. Those case studies represent episodes of design

refinement and design innovation sequences stemming from the designer-user interactions in the of design and IT innovation process.

Literature Review

In this section, we reviewed the following three research topics as a relevant scope of the designer-user interaction during a design process: (1) the current understandings of the designer-user interaction, (2) the definitions, drivers, and the types of product/service design and IT innovation, and (3) the characteristics of tangible/intangible artifacts that facilitate design innovation are summarized from the previous ISD, Management Science, UCD, and PD literature.

Designer-User Interaction

The communities of ISD, management science, UCD, and PD have long recognized the value of user participation during a design process and designer-user interaction in the process of design / IT innovation.

In ISD and management science, Churchman and Schainblatt (1965) persuasively argued the importance of designer-user interaction as a successful application. As an empirical approach highlighting the importance of designer-user interaction, Boland (1978) tested a more effective protocol of user interaction in ISD, and Salaway (1987) tested two different organizational learning models between users and analysts. In reality, just two studies have empirically tested the mutual interactions between IT designers and IT users; however, current system design process research calls for more attention to this research. Also, Griffith (1999) theoretically proposes a model how IT designers can make IT artifacts and how IT users can take the designer's outcomes as an ecological perspective in IS.

Interaction patterns between IS designers and IS users have also been considered in order to create successful IS products. Baskerville (1996) regarded prototypes between systems developers and users as tools of risk analysis and IS control in ISD. Marakas & Elam (1998) investigated software design semantic questioning patterns between analysts and users in software system development. In addition, McLean (1979) offers an alternative model in which end-users can be application developers in ISD.

In ISD, few researchers have focused on communication problems between designers and users so that they might decrease emerging design problems and combine designer-user requirements during a design process. Kaiser & Bostrom (1982) regarded IS research problems as communication gaps among a user, a manager, a system analyst, and their different considerations in a MIS project team. Levina (2005) also argued for the importance of design collaboration among different stakeholders in a design project. In order to combine multiple stakeholders' design actions and opinions, she discovers how two different companies can manage organizational issues by collaborating in the process of design projects. Newman & Robey (1992) showed the designer-user co-creation as a social practice to generate design episodes and patterns together in ISD. Robey (1994) proposed a modeling of interpersonal processes in order to overcome the conflicts by understanding the importance of interpersonal activities in ISD. Barki & Hartwick (2001) also tested how IS designers and users can minimize interpersonal conflicts that occur in ISD. Although a few studies have highlighted the designer and user's communication problems and gaps, they do not provide any constructs or models to conduct empirical testing. On the other hand, Hippel (1976; 1986; 1994) more highlighted users' leadership and suggested 'user-driven innovation' in design and IT innovation.

In UCD and PD research, Bucciarelli's (1994) concept of *object worlds* demonstrated that people with various backgrounds inhabiting different worlds would see a design object differently. Based on this concept, Lehoux and Hivon (2011) explained the benefits of user participation as a variety of knowledge they bring in because with the knowledge design problems can be reframed or solved from fresh perspectives. Also, Kensing and Munk-Madsen (1993) identified the six areas of user knowledge and relevant participatory design tools and techniques.

In addition, many UCD methods and frameworks have been developed for revealing users' unmet needs and addressing them with design solutions. Crabtree (1998) and Lloyd (2000) highlighted the importance of ethnographic research techniques during a UCD process. Owen's Structured Planning method (2001)

allows for systematic syntheses of design solutions based on the analysis of the user's activities, functions, and environmental information. Gero's Function, Behavior, and Structure (FBS) model (1990) captures only meaningful user behaviors and optimizes the design process around them.

Language-based communication is a necessary part of the designer-user interaction, but it also imposes many limitations that have been discussed as the concepts of *language-games* (Wittgenstein, 1953/1968; Ehn, 1988), the user's *tacit knowing* (Polanyi, 1966), and the psychological, physical, and cultural distances between the user and the researcher (Gaver et al., 1999). In order to address these limitations, alternative research methods are developed. One approach exploits the materiality of mediating artifacts to facilitate designer-user interaction and includes *Participatory Design Games*, *Cultural Probes*, *Generative Techniques*, and *Behavioral Prototyping* (Brandt, Messeter, & Binder, 2008; Ehn & Kyng, 1991; Gaver, Dunne, & Pacenti, 1999; Poggenpohl, 2002; Sanders & Stappers, 2008). The other approach is seeing the designer-user interaction as a collaborative construction of mutual knowledge with which design problems are defined and solutions are created. This approach shifts the focus from how users' current knowledge is revealed to designers to *how the interaction expands designers' and users' knowledge*. This approach works better for the actual design process where not only solutions but also problems evolve over time (Dorst & Cross, 2001; Suwa et al., 2000). With the second approach, designers and users are encouraged to think beyond the knowledge within a person, department, or problem domain by reframing the current design problem and finding solutions from various domains.

Product / Service Design and IT Innovation

Van de Ven (1986) suggested a framework to define four basic factors of innovation -- new ideas, people, transaction & process, and strategy & institutional contexts, and he discovered integrative ways how the four basic problems (idea, human, process, and structural problem) can be fit together in managing part-whole relationship. Based on his argument, this paper, we see innovation as an innovative problem-solving encountered in the design and IT product and service innovation process.

Regarding the drivers of product / service design and IT innovation, many studies recognize the importance of multi-disciplinary collaboration as "innovation occurs at the boundaries between mindsets" (Leonard-Barton, 1995). Design and IT innovation research, Dougherty (1992) opened the issues of successful product innovation and investigated the people of technology, field, manufacturing, planners in five companies to understand technology-market relation and identified differences in the thought world systems of meanings about product innovation. Hargadon and Sutton (1997) observed how IDEO employees play technology broker roles and exploit a broad range of technological solutions by making analogies between current design problems and past solutions. Hagadon & Bechky (2006) observed how the locus of creative problem solving shifts and demonstrated four moments (helping seeking, help giving, reflective framing, and reinforcing) in the ongoing contexts of creativity. Bechky (2003) argued the importance for knowledge-sharing among multiple stakeholders and pointed out the spaces of misunderstandings among different stakeholders because of different language usage among them in the process of design. Carlile (2004) developed a framework of three processes (transfer, translation, and transformation) through which knowledge crosses syntactic, semantic, and pragmatic types of boundaries. Kellog et al. (2006) investigated how different stakeholders perform boundary-spanning coordination work and how they can coordinate practices in order to synthesize visible representations for their works.

Different types of innovation have been classified with either one-dimensional dichotomy (radical–incremental, continuous–discontinuous) or multi-dimensional categories. Borrowing from previous research, Slocum & Rubin (2008:11) defined radical innovation as 'innovations that could not have evolved through improvements to, and modifications of, the existing technology' that '[offers] unprecedented performance features [...] for significant performance or cost improvements', while incremental innovations 'improve upon and extend existing technology'. Cited in the same paper, Henderson and Clark's (1990) framework adopts two dimensions (core concepts are reinforced–overturned/linkage between core concepts and components are unchanged–changed) to categorize innovation into four types: incremental, radical, architectural, and modular. Among the four, incremental innovation preserves the core concepts of existing product/service and the linkage between core concepts and components, while in radical innovation the core concepts are overturned and the linkage between core concepts and components are changed.

Therefore, in this paper, we understand the importance of multiple stakeholders' interactions and highlight the designer-user interaction as the core of design and IT innovation process. Especially, this paper focuses on designers' perspective as a crossing boundary action to overlap users' boundary, which is explored as design refinement and design innovation sequences in the process of design and IT innovation. In the next section, how tangible and intangible artifacts can facilitate design innovation will be summarized.

The Characteristics of Artifacts that Facilitate Design & IT Innovation

We see most *tangible* artifacts between designers and users can be defined as different types of prototypes, and this research area seeks to *intangible* interactions in the process of design and IT innovation.

Design prototype as the tangible artifacts of the designer's intention and action has been studied in the context of design innovation as it allows for representation and transformation of project participants' knowledge (Carlile, 2002). Prototypes are categorized as conceptual, behavioral, procedural, and appearance types according to the aspects they represent (Chayutsahakij, 2001). Kensing & Munk-Madsen (1993) mentioned that horizontal prototypes that show all intended functions are used at the early stage during a PD process when user requirements are defined, but vertical prototypes are used to show all selected functions in intended final forms in the later stages. Gero (1996) argued that prototypes—representations of the structure of a product/service, how the structure and behaviors are related, and how the structure and functions are linked—facilitate the creative design process; by manipulating prototypes, participants can either add or substitute variables of the current problem and come up with innovative schemas for new design and IT products /services.

Intangible interactions between designers and users should be considered with the same weight because intangible designer-user interaction is also a form of artifact that facilitates design innovation. Narratives and dialogues are useful intangible interactions. Tsoukas (2009) stated the importance of dialogue by asking how new knowledge is created in organizations. Bartel & Garud (2009) proposed the innovation narratives as a cultural mechanism that combines ideas to generate novelty, acts real-time problem-solving, and links between present innovation efforts, past experiences, and future aspirations for the sustaining innovation. Vaara & Tienari (2011) argued the role of discourse in the cultural construction of organizations and highlighted the use of narratives as central discursive resources in unfolding organizational change. Moreover, UCD and PD research areas have sought to discover alternative methods and techniques for the design and IT innovation process. Rust (2004) described the value of enactment techniques—acting out behaviors of the future users of a product/service as part of qualitative user research—as the externalization of research participants' tacit knowing. Drama techniques (Brandt and Grunnet, 2000) are widely used as a way of gaining concrete understanding of users and current design problems. Actions taken to show function, structure, or behavior of a product/service are modeling or prototyping with gestures. Actions can be taken as analogies to help the understanding of problems and externalization of designers and users' knowledge. This study argues that designer actions that build mutual knowledge function as boundary objects and shape the design outcomes

Lessons from the Literature Review

From the literature review, this study recognizes the need of the designer-user interaction from a socio-cultural perspective and highlights designers' a crossing boundary action to overlap users' one, which is explored as design refinement and design innovation sequences in the process of design and IT innovation. During a design process, the designers and users' current knowledge and perspectives are expanded through their interactions, and the boundary crossing interaction between designers and users results in shared knowledge building, recognition of relevant knowledge in different domains, and analogical thinking that transforms knowledge in one domain into a solution in another domain. The designer-user interaction as a *boundary crossing activity* is an intangible interaction that facilitates either an incremental type or a radical type of innovation. A new model of designer-user interaction will be described in the next section.

Theoretical Considerations

In order to build a new model of designer-user interaction, we adopt Bourdieu's theory of practice (Bourdieu, 1973, 1986, 1998; Bourdieu & Nice, 1997; Bourdieu & Wacquant, 2004) and the concept of Boundary Objects (Star and Griesemer, 1989) as frameworks to analyze interactions between designers and users

Bourdieu's Theory of Practice

Bourdieu's theory of practice explains how an individual who is cultured within a society of conventions and rules forms certain attitudes and perspectives that are revealed in his/her daily practices. In this model, field is 'a series of institutions, rules, rituals, conventions, categories, designations, and appointments [...] which produce and authorize certain discourses and activities.' (Webb et al., 2002:42); habitus is 'the values and dispositions gained from our cultural history that [...] allow us to respond to cultural rules and contexts in a variety of ways' (Webb et al., 2002:36); practice is produced from habitus and habitus exists in moments of practice. This theory explains how individuals interpret/negotiate the given socio-cultural structures or rules (field), and shape their own perspectives (habitus) in their daily practice in a society.

When applied to the interactions between designers and users during a project, the theory of practice lets us see a design process as series of actions of participating stakeholders. It consists of field as rules of action, habitus as modes of action, and practice as situated actions. The field as rules of action is a collection of ideas; the rules include categorization, hierarchy, and definition of concepts, artifacts, and behaviors considered legitimate by stakeholders. The habitus as modes of action is the various perspectives and attitudes from which stakeholders see current design problems. While habitus is formed from the ideas stakeholders selectively draw from field, it only exists in the stakeholders' situated actions (practice) of representing and co-creating design problems and solutions. Stakeholders become aware of field through the reflexive process of exploring tangible/intangible artifacts such as design problems and solutions, and underlying habitus.

Regarding the interactions between designers and users, in this study, the authors propose two different design sequences based on the theory of practice: design refinement and design innovation. We see the process of design refinement as reinforcement of current field, habitus, and practice; whereas design innovation is the changes in the field and practice of involved designers and users as they change their habitus during the product/service development.

In the sequence of design refinement, or incremental innovation, the core concepts and the linkage between core concepts and components are preserved (Henderson and Clark, 1990). In this sequence, designers and users' current practice of designing and using the product/service, developed from their field and habitus, is reinforced: field influences habitus and habitus influences practice.

Yet, in the sequence of design innovation, or radical innovation, the core concepts are overturned and the linkage between core concepts and components are changed (Henderson and Clark, 1990); Designers and users change their perspectives towards design problems and solutions (habitus). As a result of the change, the course of actions (practice) and how the product/service works and what constitute feasible solutions (field) are changed from newly acquired knowledge and perspectives. The design innovation sequence takes a different cycle from that of design refinement: changes in habitus influence practice and field.

The idea of design refinement and innovation sequences will be illustrated further with case studies. In the next section, how designer-user interaction functions as a Boundary Object (Star & Griesemer, 1989), leads to either direction of the two sequences, and characterizes synthesized designed artifacts in the end.

Theory of Boundary Objects

For designer-user interaction, tangible artifacts and intangible interactions can function as effective boundary objects, which afford the discovery of meanings, definitions, and understandings between stakeholders in separate social worlds, different social groups, and multiple social actors. The original term refers to artifacts designed to mediate and translate different perspectives of all amateur and professional participants in a museum project. Three types of boundary objects are identified in the research literature so far: objects—repositories, database, and parts of libraries, models—standardized

forms and methods for problem solving across different functional settings, and maps—representations such as Gantt charts, process maps, and workflow matrices (Star and Griesemer, 1989). Carlile (2004) expanded this definition and viewed intangible knowledge as a boundary object when it is shared as common knowledge among project stakeholders and let them see how one's domain-specific knowledge is different but dependent on the others'.

What makes an effective boundary object, as Bergman et al. (2007) argued, are the following four conditions: they inhabit several social worlds; they satisfy the institutional requirements of each social world; they are weakly structured in common use; and they are strongly structured in local use. Carlile highlighted how a boundary object 'establishes a shared syntax or language for individuals to represent their knowledge', 'provides a concrete means for individuals to specify and learn about their differences and dependencies across a given boundary', and 'facilitates a process where individuals can jointly transform their knowledge.' (2002:451–452)

The authors hypothesize that designer actions can function as boundary objects that lead to the design innovation sequence if they support stakeholders to (1) share and represent their knowledge in communicable forms for other stakeholders, (2) find commonalities, differences, and dependencies between each person's knowledge, and (3) make analogies for each person's knowledge to transform it from one domain to another. Such actions will encourage stakeholders to think beyond the limit of each person's individual knowledge. The world they experienced/understood will be expanded and their perspectives from which they view current design problems (habitus) will be changed. Expansion of field—individual participants' conventional understanding on how the product/service should work—follows when the stakeholders start to see alternative ideas. Subsequent practice of developing product/service reflects the changes in habitus and field.

A Model for Design Refinement and Innovation Sequences

Drawing from theoretical backgrounds, this study proposes a model of designer-user interaction that leads to design refinement or design innovation sequences shown in Figure 1. In this model, a design process is viewed as a socio-cultural phenomenon wherein participating stakeholders become aware of field as rules of action and habitus as modes of action with which they participate in practice of shaping designed artifacts. Not only do they become aware of relevant implicit rules, assumptions, and perspectives, but they also have the opportunities to evaluate, examine, and expand them for design innovation.

Regarding the research question, the changes in designers' understandings of users' physical and social worlds that lead to design refinement or design innovation sequences, the authors suggest the following distinctions: First, in the design refinement sequence, designers reinforce the current core concepts and components of the product/service. Design problems are framed within the conventional definitions of the product/service. Project stakeholders' field, habitus, and practice are maintained. The field in which the design problems and all relevant social conventions reside is reflected upon their habitus, and the habitus manifests itself in the practice.

Second, in the design innovation sequence, significant changes happen in stakeholders' perspectives (i.e. habitus as modes of action) on design problems and requirements. Although designers usually moderate the significant changes, the changes are the result of enlightening interactions among stakeholders. The knowledge shared from one domain and adapted to another domain encourages stakeholders to re-examine what they have considered as unchallengeable or inevitable (i.e. field as rules of action). Design problems reframed from new perspectives often lead to structural changes in the core concepts and components of the product/service. Both the design problems and solutions evolve in practice as stakeholders' field is expanded and habitus is reformed.

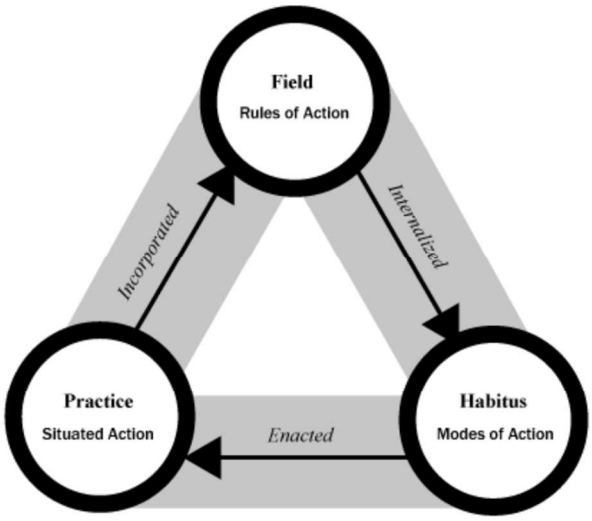

Figure 1. Model of Designer-User Interaction Interpreted with Bourdieu's Theory of Practice

Regarding the design innovation sequence, the authors hypothesize that designers' attempts are made to (1) question what stakeholders have considered normalcy and commonality (i.e. field); (2) impart their knowledge in various domains that can broaden stakeholders' field; (3) moderate analytical thinking on how the knowledge interrelates among various domains, as well as pertains to current design problems; and (4) facilitate analogical thinking to adapt design problems and solution ideas from one domain to another based on newly acquired knowledge. Such designer actions enable changes in habitus that trigger subsequent changes in field and practice. The proposed model will be further explained with empirical data in the next section.

Case Study

The objective of this study is to represent a theoretical model for how designer-user interaction can identify design / IT innovation in the design process. Therefore, using case studies (Yin 1994; Eisenhardt 1989) is an appropriate research method to demonstrate our proposed theoretical model (Figure 1). This section presents four project episodes that represent processes how designer-user interaction can lead design / IT innovation during a design project. These four case studies involve two in-depth interviews and two field studies. The interviews were conducted with user experience (UX) designers, who have direct interactions with users in the areas of design / IT innovation. In addition, the field studies were conducted in a product design consultancy and an IT mobile content & solution application agency.

Table 1 shows the selected four case studies and their contexts.

Table 1. Overview of Case Study

	Areas of Design	D-U Interaction	Design / IT Innovation
Case 1	IT Service Design Refinement	Direct user interaction: Be the Customers	Reinforcing the existing online grocery market with a new sale promotion
Case 2	Product Design Refinement	Design decision: two modes of D-U interaction on users' complaints	Reinforcing the current product design forms and functions
Case 3	Systems Design	Direct user interaction:	Creating a user-centered grocery market transportation systems for a new online

	Innovation	ethnographic research	grocery market
Case 4	Organization Design Innovation	Direct user interaction: Evaluation and testing	Creating a tangible protocol (e.g. manuals) from intangible interactions

These cases as design episodes from the interviews' and field studies' data demonstrate how designer-user interaction can identify a design refinement sequence (case 1 & 2) and a design innovation (case 3 & 4) in the design / IT innovation. To categorize design refinement and innovation sequences, we identify the types of innovation incremental and radical types of innovation are further explored as design refinement (reinforcing the existing design products and services) and design innovation (creating new design products and services) sequences based on Henderson and Clark's (1990) framework. Therefore, as table 1 is shown, case 1 and 2 illustrate the cases of design refinement with relation to IT service design (Case 1) and project design (Case 2). On the other hand, case 3 and case 4 demonstrate design innovation the cases in the contexts of systems design (case3) and organization design (case 4).

These four cases of the designers' activities and interactions with users were analyzed with the grounded theory approach (Strauss & Corbin, 1990) in two stages: first, the open coding stage revealed the structures of the projects, the recurring themes, interesting moments, and unique interactions with users. Second, the axial coding stage revisited the themes found in the first round of coding and determined relevant patterns (Boyatzis, 1998).

During these processes, designer-user interaction characterizes different categories of actions in field, habitus, and practice. Also, the characteristic interactions between designers and users elucidate the sequence of innovation or refinement in the design/IT innovation. Based on our proposed model in Figure 1, the case studies discover the following meanings: '*field as a tangible outcome*' (e.g. new design products or services) stemming from designer-user interaction; '*habitus as invisible designer-user interaction*' (e.g. design decision or orientation); and '*practice as visible designer-user interaction*' during a design process. Particularly, designers' habitus (a part of habitus) and designer-user interaction (a part of practice) iteratively enhance each other and overlap designers' and users' boundaries as a *boundary crossing activity* (e.g. an intangible interaction) in the design process. Therefore, in this study, we highlight how designer-user interaction could identify the domain of information, synthesize relevant system thinking, and create design opportunities in the process of design.

Case 1: Be the Customers: IT Service Design

In 2010, Alpha (pseudonym) Telecom & Communication conducted a qualitative research study with an ethnographic approach to devise effective face-to-face promotion strategies for the sales of their new broadband Internet product. The competition in the internet product market was deepening and diversifying, and Alpha UX designers were all well aware that their biggest competition, Beta (pseudonym) Telecom, had successfully increased subscriptions via multi-channel promotion such as face-to-face promotion events in addition to online promotion activities. The Alpha UX designers decided to try face-to-face promotion events as well at a local grocery store, but instead of a traditional approach (e.g. setting up a booth at one corner and handing out ad brochures to approaching customers), they wanted to make it a more relevant and useful experience for the shoppers. To gain inspiration, the Alpha UX designers planned a new research technique: be the customer. They went to the grocery store and became shoppers to learn about the shoppers' needs, goals, activities, and challenges during the process. Being the customer was a particularly insightful observation opportunity to the male members of the team as they were less interested and less experienced than female customers in grocery shopping in general.

Designers identified four opportunities for approaching shoppers in the preparation, selection, acquisition, and checking out steps. First, during the preparation step, before they entered the store, people were observed going back and forth between their cars and the shopping cart corral or searching their pockets as they needed coins to deposit to use the carts. For some customers, finding the right coin was a significant challenge. Secondly, during the selection of merchandise, some shoppers appeared to wonder how to pick fresh produce. Third, the acquisition of merchandise was rather quick and easy for customers who walked in with shopping lists, whereas it was a more time consuming task for the others. Lastly, during the check out step, some customers had to buy plastic bags for their purchases while others brought their own bags.

The Alpha UX team took advantage of these four opportunities and prepared four promotion items: a printed ad of Alpha Broadband Internet with a coin attached, the same ad printed with a blank shopping list, the ad with grocery shopping advice, and plastic bags with the ad. In the promotion event, shoppers gladly accepted promotion items as the items were relevant to their context. The promotion was very well received, so the local grocery store even suggested continuing it for several more days.

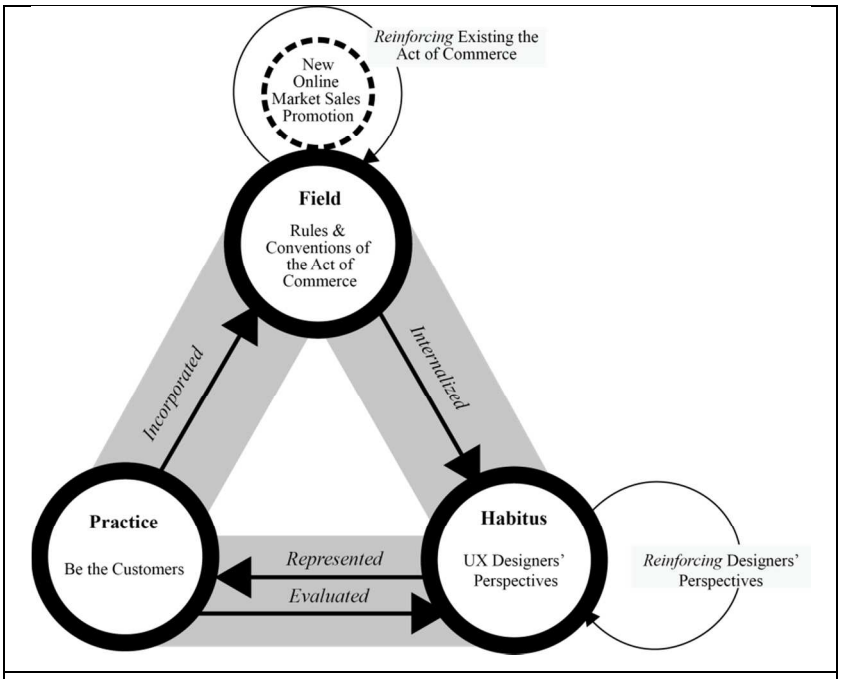

Figure 2. Case of IT Service Design Refinement

As Figure 2 represents, the Alpha UX team's approach shows the case of a refined promotion design based on the designers' newly acquired knowledge of the grocery shopping process and shoppers' needs. The idea of taking advantage of the grocery shoppers' unmet needs was gained from "be the customer" research through which the Alpha UX team witnessed the difference between their rather abstract understanding of the grocery shopping experience and the customers' real and concrete challenges. In relation to the proposed model, this is a case of design refinement as field (the rules, conventions, and ideas relevant to the act of commerce), habitus (design orientations of multi-channel promotion activities from their past experience and the competition's success), and practice (sales promotion) are ultimately maintained, but the design team's habitus is reinforced with a novel approach (making the promotion activity relevant to the user's context for better reception). Habitus in case 1 refers to the Alpha UX team's reinforced perspectives on the act of sales promotion, especially face-to-face promotion strategies. With Be the customer as visible interactions with users, the Alpha UX team gained more knowledge on the act of grocery shopping, and their idea of an effective promotion strategy was concretized with the shoppers' four challenges transformed into four contextual opportunities for face-to-face communication.

Case 2: Two Modes of D-U Interaction: Product Design

One author conducted a field study in a project design agency located in Cleveland, Ohio, U.S.A from January to March 2011. The company develops strategic design concepts, prototypes, and, manufacturing controls. In this field study, this case represents product design refinement, in which the author participated in designers' project meetings and observed their design processes. The Telos' network phone redesign process demonstrates how designers' habitus can identify a strategic decision-making process to organize designers' actions and lead to a successful design development regarding users' requirements.

This project started because of users' complaints. When users used the Telos network phone, they felt electric shocks. Telos understood that this was a serious product problem directly linked to users' behaviors, product survival, and product sales as well. Therefore, Telos decided to work with Smartshape

as an outsourcing design, product, and manufacturing division to identify the detailed problems and to discover design opportunities in order to synthesize a reliable solution. After Smartshape joined this project, they set up a communication route among Smartshape, Smartmerit, Telos, and a manufacturing company working for Telos. With this communication linkage, Smartshape and Telos sought to define a project strategy and direction to identify problems. Also, Smartshape considered how they could create tangible prototypes as design solutions.

In this project, Smartshape designers tried to deal with the electric shocks with functionality and engineering issues as well. Based on this design orientation, they broke down this problem into two separated design issues: (1) finding an appropriate sink-mark position, and (2) changing the surface material and improving its quality. Therefore, in this product design refinement process, designers' interactions can be summarized to conduct a rational approach as the followings: (1) how to solve the electric shocks problem with a functional view; and (2) how to improve the product's surface material and quality with a feature view. This approach uses the designers' habitus to overlap designers' and users' boundaries to meet users' requirements (e.g. eliminating electric shocks) and improve the company's decisions (e.g. product quality) through strategic problem-solving interactions in the product design refinement process.

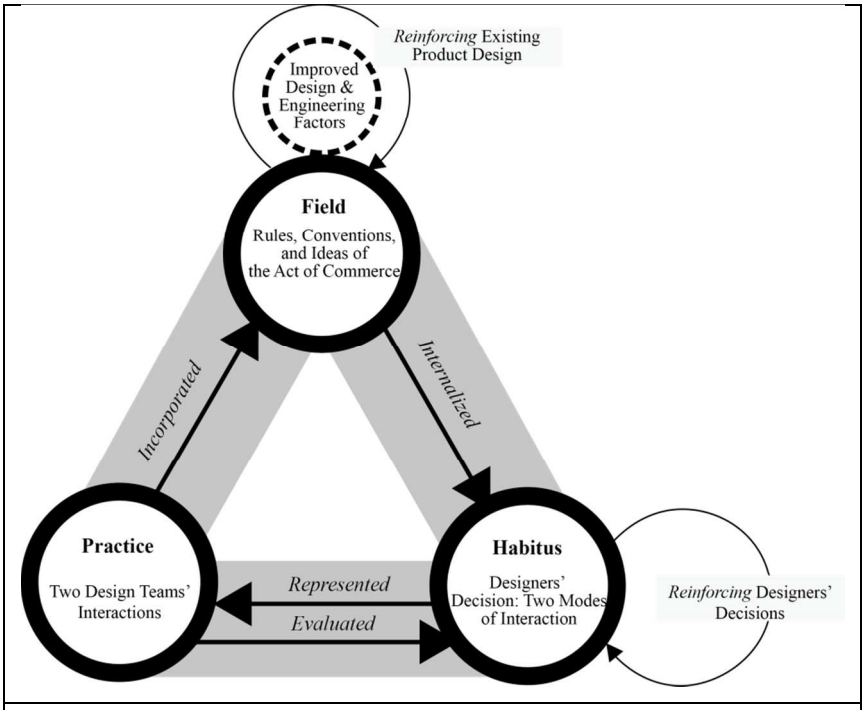

Figure 3. Case of Product Design Refinement

Figure 3 illustrates the case of product design refinement: in relation to the proposed model, field (users' complaints on the existing product) is expanded with designers' interactions on users' complaints and pain points. The designers' habitus is defined as action overlapping users' and designers' boundaries by identifying two design decisions. The designers' habitus reveals visible interactions at the level of practice; the designers have tested possible design opportunities which combine engineering and design issues that address users' requirements. As this figure shows, the designers' habitus has discovered alternative actions regarding user requirements in the design process. Consequently, the design team suggested a final design outcome to field, which changed the position of the sink mark in order to remove electric shocks and changed the surface material from metal to plastic.

Case 3: Beyond User Interaction: Systems Design

In 2008, Gamma (pseudonym) IT Solution designed and implemented a new grocery shopping service for Delta (pseudonym) department store supermarket. The service is targeted to residents in the X district (a suburban residential area): most of them are in their 20-30's, newlyweds or working couples, work in

downtown, and have very little time for grocery shopping thanks to their long commuting distances. Therefore, the Gamma system designers conceptualized a new service concept of receiving the users' shopping orders over the Internet on Delta's online shopping mall and delivering groceries to their homes within two hours.

For the idea, the Gamma designers felt they needed a completely new approach. Typically a grocery shopper goes through steps of researching, browsing, collecting, paying, and transporting food items. While Gamma's previously built e-commerce solutions are designed as separate subsystems of each step packaged as one in the end, the new service idea requires an integrated solution of online and offline components: The online catalog/order/payment system should be designed considering seamless flow of transaction data between subsystems. The offline components of retail space layout, human shopping agents, and delivery arrangement after payment should be optimized for fast collection and delivery of groceries. For inspiration, Gamma designers conducted a qualitative study using a variety of ethnographic techniques. From the data gathered, designers observed several issues to address, including the discrepancy between online store product categories and offline store product layout that may cause significant delay during the item collection.

Through the research activities, designers conceived the initial design idea and identified three key components. First, pickers are human shopping agents who pick up internet-ordered items on behalf of their customers. Second, Delta's offline supermarket product categorization is made congruent to Delta's online product categories, as well as Delta's offline supermarket layout is optimized for the picker's efficient item collection. They also improved grocery bagging procedure to minimize delivery damage. Third, the online system was designed to seamlessly pipe the customer's order, payment, and collection information for all involved parties, providers, seller (i.e. Delta), pickers, and carriers. Delta's new service successfully delivered groceries to X district residents within two hours.

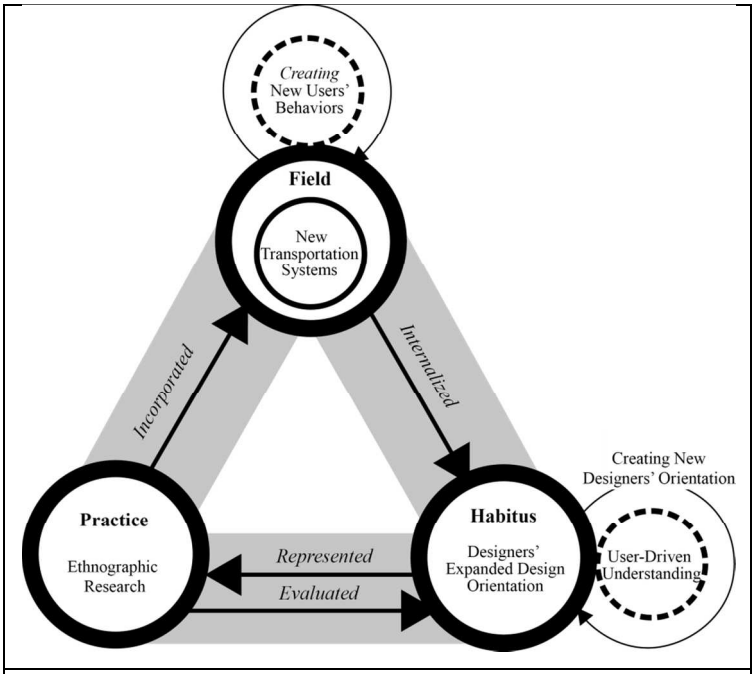

Figure 4. Case of Systems Design Innovation

Figure 3 illustrates the Delta grocery service as a case of design innovation: in relation to the proposed model, field (the rules, conventions, and ideas relevant to the act of commerce) is expanded with the addition of a new form of grocery shopping, which was made possible when Gamma designers changed their habitus (a perspective on the concepts of grocery shopping, retailer, and customer), and redefined practice (the changes in the retailer and customer roles). Through research activities as boundary object, Gamma UX team was able to see how the solution in one domain (Internet shopping in general) can be transformed for the problem in another domain (grocery shopping), and expanded the knowledge of retail service, retail space, and IT system design along the way. Habitus in case 3 refers to the Gamma system

designers' evolved perspective on the act of grocery shopping. The Gamma UX team gained new knowledge on the current practices of commerce, as well as the challenges that X district residents are facing, with ethnographic research activities as a boundary object. The solutions from other E-commerce domains were transformed as a solution in the domain of grocery shopping, by questioning the conventional merchant and consumer role division.

Case 4: Creating a Communication Protocol: Organization Design

In 2011, a field study was conducted at INS Lab, a mobile content and solution company, located in Seoul, South Korea. To create new mobile contents & solutions, this company utilizes their fast communication and decision-making as the most important capability to create a variety of versions of prototypes. This organization is divided into two creative departments--design and IT developers. Although this organization is made up of only seven creative designers, eight IT developers, and the president, they recognize how they can best manage their workflow effectively. This case also represents an innovative problem-solving that they encountered in a design project.

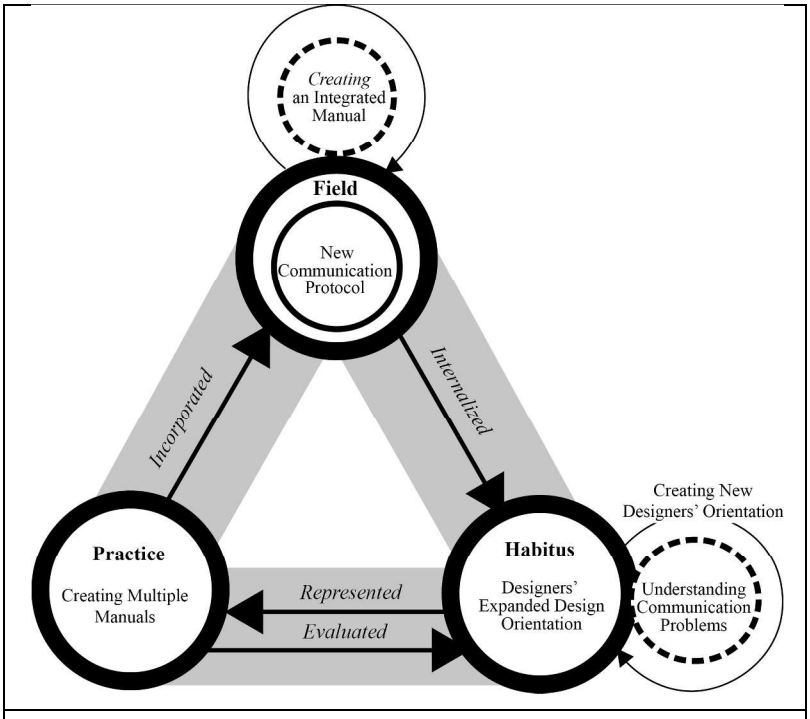

Figure 5. Case of Organization Design Innovation

As a mobile application agency, INS Lab conducted a mobile design solution project for the Korean Assembly. In this project, they developed a main mobile solution and sub-contents. In this project development process, designers have encountered an important challenge to capture users' hidden needs and a series of information as users' requirements. In reality, congressmen and their secretaries as a major user group are very busy, and it was hard to conduct a real field study.

At the first stage, designers and IT developers conceptually developed a prototype and simulated it in front of users (congressmen's secretaries). But, the users' reactions brought the INS designers and IT developers to a design dilemma. First of all, the users did not have any previous experiences about assembly mobile solutions, so they could not make a decision directly. In addition, they wanted to see the other prototypes. From this evaluation stage based on real interactions with users, the designers and IT developers identified a communication problem among users, designers, and IT developers.

To address this problem, they discovered alternative ways to combine the multiple complex issues that no single person could understand fully in the whole development process. With this consideration, they synthesized a tangible communication boundary object to understand their mutual knowledge and practice regarding users' requirement. As a result, the designers and IT developers created an emerging

manual as a crossing boundary object that includes the multiple views on users. To understand multiple complex information and requirements, designers and IT developers created their own versions of development manuals regarding users. Based on these two separated versions of development manuals, they integrated the final one as a communication boundary object, in which they posit users as the center of their development process. Consequently, the users understood the whole development how designers and IT developers conducted design aspects (e.g. forms and functions) to create the assembly mobile application solution.

Figure 5 demonstrates a mobile application company's organization design as a case of design innovation: in relation to the proposed model, filed (a new identified communication protocol) is expanded with the designers' design orientations for understanding communication problems. Considering the proposed model, field does not exist in that the history of actions and existing products & services. From the designers' orientation by understanding the importance of communication problems in habitus, designers created multiple prototypes regarding users' behaviors in practice.

Implication and Conclusions

This paper highlights how designer-user interaction can lead design innovation and refinement with a socio-cultural view in the design process. Particularly, we focus on designers' crossing boundary interaction to overlap users' one. In addition, this paper proposes a model for design refinement and design innovation sequences on Bourdieu's theory of practice and the concept of boundary objects. As empirical evidence, it represents four case studies which include detailed designer-user interaction episodes from interviews and field studies to the proposed model. This paper provides three contributions in Information Systems, Management Science, and User-Centered Design & Participatory Design communities: First, it suggests a theoretical model of designer-user interaction and its impact in the design & IT innovation; Second, it empirically theorizes what types of designer-user interactions emerge, occur in sequence, and evolve in the design process with case studies; Third, it productively crosses disciplinary boundaries between technological environments and social theories by adopting Bourdieu's theory of practice, the theory of Boundary Objects, and consolidates these theories in order to demonstrate the interactions between designers and users during a design process.

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