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PATTERNS OF DESIGNER-USER INTERACTIONS IN THE DESIGN REFINEMENT PROCESS

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Abstract

In this paper, we empirically explore designer-user interaction patterns in the design refinement process. To do this, we ask the following research question--what do interactions between designers and users characterize distinctive patterns in the design refinement process? As an empirical approach, this study analyzed twenty-seven design refinement project narratives with a grounded theory approach and synthesized three patterns, regarding six sub-designer-user interaction patterns in the design refinement process. The significance of this study is to empirically theorize the patterns of designer-user interaction and suggests a theoretical / practical guideline for researchers and practitioners in the communities of design science and information and organization studies.

Keywords: Designer-User Interaction Patterns, Design Refinement, Bourdieu’s Theory of Practice, Boundary Objects, Digital innovation
1 INTRODUCTION

In information systems (IS) research, three innovation studies (IT, product, digital innovation) have identified new products, systems, and services as IT-enabled social innovations in our societies. These identified IT-enabled social innovations have also improved the established forms, functions, and features, because the existing innovations require betterment – that is a design routine (Pentland & Feldman, 2008). In the design routine, we believe that designer-user interaction acts as the central function in discovering certain design outcomes and validating them in the design processes (Park, 2012; Park & Boland, 2012).

Since Churchman & Schainblatt (1965), current IS design studies have struggled to invite users and their information environment. During more than 40 years in IS design research, the designer-user interaction studies have released two research problems. First, the established design vocabularies (design methods, methodologies, and approaches) have not adequately documented about how designers could invite users and interact with them in the design process. Second, most IS researchers and practitioners have more focused on the radical IT innovation rather than design innovation and refinement. Yet, most designers (e.g. IT developers, creative designers) encounter a variety of projects and assignments for discovering and validating the established concepts and components in products, systems and services. To argue this problem, in this study, we adopt Henderson & Clark (1990)’s innovation category, and interpret a design refinement as an incremental innovation for providing a series of qualified information, the organized forms of interactions & systems, and betterment of the existing design applications.

Considering the importance of the designer-user interaction, a few prior IS researchers have argued the importance of user (customer) interaction of how designers (developers) could invite users and interact with them in the design process. With this consideration, some IS researchers have sought to enhance the IT value by understanding users’ requirements (Jarvenpaa & Tuunainen, 2013). With the view of design refinement (incremental innovation), Norman & Vergant (2012) argue the different innovation approaches in the design process. Although there are a few researchers have argued the two research problems (1) the importance of designer-user interaction and (2) the importance of design refinement), there are not any theories, patterns, and models on the designer-user interaction in the design refinement. Based on these two problems, the objective of this study is empirically to explore the patterns of designer-user interaction in the process of design refinement, and it highlights how the designer-user interaction patterns could identify the incremental innovations, which reinforce current concepts and components.

With these two research problems and a research objective, we ask the following research question--what do interactions between designers and users characterize distinctive patterns in the design refinement process? To address this research question, we adopt Bourdieu’s theory of practice (Bourdieu, 1973, 1986, 1998; Bourdieu & Nice, 1997; Bourdieu & Wacquant, 2004) as a theoretical foundation for understanding how designer-user interaction could lead a sequence of refinement in the design process. As empirical evidence, this study collected twenty seven design refinement project narratives and analyzed them with a grounded theory approach (Strauss & Corbin, 1990) for understanding the micro dynamics between the designer-user interactions and their resulting outcomes in the design refinement process. As a result, this study synthesized three designer-user interaction patterns with six sub-patterns in the design refinement process.

This study makes three contributions. First, it empirically theorizes the patterns of designer-user interaction in the process of design refinement. Second, it argues the incremental innovation and its patterns as an empirical study. Lastly, it will give a practical and methodological direction s for the communities of IS design artifacts of how the IS designers could interact with IS users in creating better design outcomes in the process of IS design refinement.
2 LITERATURE REVIEW

This study explores patterns of interaction between designers and users in the design refinement process. In the previous research, a few IS researchers have partly dealt with the importance of designer-user interactions in information systems development (ISD) and three innovation studies (IT, product, digital innovations).

2.1 Designer-User Interaction in Information Systems Development

Previous information systems development (ISD) studies have investigated the designer-user interaction in the communication problems, the user involvement, and the success of IS products.

Some IS scholars have argued the communication problems between designers and users. Kaiser & Bostrom (1982) argue communication gaps among a user, a manager, a system analyst, represented their different personality in the design team based on thirty two IT organizations. From this empirical study, they concluded IS success is highly related to the users’ characteristics than analysts’ one. Levina (2005) argues design collaboration among multiple stakeholders in order to combine different design actions and opinions. Robey (1994) proposes a model of interpersonal processes in order to overcome the conflicts by understanding the importance of interpersonal activities in ISD. Barki & Hartwick (2001) test how IS designers and users can minimize interpersonal conflicts that occur in ISD.

With the view of user involvement, prior IS researchers have considered how users can become a more active stakeholder group in ISD. Ives & Olson (1984) investigate the degree of user involvement in creating a final IS product. Schonberger (1980) suggests a contingency model including user involvement and decision making. Tait & Vessey (1988) argue the effect of user involvement in a contingency approach for system success. Hirschheim (1989) explores participative system design with the degree of users’ involvement between social content and technical content. Kasper (1996) seeks to enhance the design of decision support systems (DSS) through user calibration of their performance.

With the respect of successful IS products, some previous IS scholars have argued the importance of interactions between IS designers and IS users. Baskerville & Stage (1996) regard prototypes between systems developers and users as tools of risk analysis and IS control in ISD. Marakas & Elam (1998) investigate the semantic questioning patterns between analysts and users in software system development. McLean (1979) offers an alternative model in which end-users can be application developers in ISD. As empirical studies, Boland (1978) tests a more effective protocol of user interaction in ISD, and Salaway (1987) tests two different organizational learning models between users and analysts.

Therefore, a few previous IS studies have sought to understand the interactions between designers and users; however, they do not produce relevant constructs, models, and patterns of how the IS designers (developers) could interact with users in ISD.

2.2 Designer-User Interaction in three innovation studies

In IS research, previous innovation researchers have discovered the values of IS artifacts and the processes in the three innovation research areas--IT, product, and digital innovations.

Hippel (1986; 1994; 2005) argues the importance of users and user-driven product innovation in the design process. Hippel (1994) identifies user-lead innovation with the concept of ‘sticky information’ which highlights users as the key problem solver. Sticky information explains how users are the core stakeholders to produce more marketable products by their tactic characteristics (Polanyi, 1966) in the process of innovation implementation. Hippel (1994) compares manufacturer-based design tasks to
user-based design tasks, and then he suggests an iterative user-manufacturer-based design model between activities, users, and manufacturers. Prior lead-user innovation researchers (Franke, von Hippel, & Schreier, 2006; Hippel, 1988) have developed their theory of lead-user innovation with two components: (1) expected benefits and (2) market-trend position. These two components represent the importance of user involvement in the process of innovation in creating the expected benefits and generating new market trends. For example, Shaw (1985) argues for the important role of interaction between the user and the manufacturer in medical equipment innovation. Hippel (1976) defines the roles of users in the innovation of scientific instrument. Hippel & Tyre (1993) consider ‘learning by doing’ as an important user activity to increase users’ voices in the process of innovation. Moreover, Hippel & Katz (2002) suggest innovation toolkits for users, contrasting “need-related” and “solution-related” and identifying elements of user-friendly toolkits.

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). In design and IT innovation research, Dougherty (1992) explores the conditions of successful product innovation and investigates the way that key people in five companies tend to understand technology-market relations. She identifies differences in the thought world systems of meanings about product innovation as an explanation for their differences in performance. Hargadon & Sutton (1997) observe 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. Hargadon & Bechky (2006) observe 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) argues the importance for knowledge sharing among multiple stakeholders and points out the spaces of misunderstandings among different stakeholders because of different language usage among them in the process of design. Carlile (2004) develops a framework of three processes (transfer, translation, and transformation) through which knowledge crosses syntactic, semantic, and pragmatic types of boundaries. Kellogg et al. (2006) investigate how different stakeholders perform boundary-spanning coordination work and how they can coordinate practices in order to synthesize visible representations for their works.

Considering the three innovation approaches, IT, product, and digital innovations have investigated the importance of IT value in firms and expanded the meanings of IT values in multiple organizations. The product innovation has improved the meaning of forms and functions among stakeholders in the innovation process. The digital innovation community has argued the importance of modularity focusing on the functions of platforms among products, systems, and services. Yet, the critical problem is that a few scholars have regarded designer-user interaction as a critical issue in creating better design outcomes in the design process. Thus, this research highlights the designer-user interaction in the design refinement process based on the lack of research in ISD and innovation studies.

3 THEORETICAL FOUNDATIONS

To address the research question, what do interactions between designers and users characterize distinctive patterns in the design refinement process? we take up Bourdieu’s theory of practice (Bourdieu, 1973, 1986, 1998; Bourdieu & Nice, 1997; Bourdieu & Wacquant, 2004) as a theoretical foundation.

Bourdieu’s Theory of Practice

socieitiy. In this theory, Bourdieu identifies field as a series of rules; habitus as the values from the cultural history; and practice as the outcomes from habitus existing in moments of practice. Based on this, we interpret Bourdieu’s theory of practice demonstrating how designers and users could produce the interaction patterns during a design process (Park, 2013). To do this, we define the three components of Bourdieu’s theory of practice as follows: (1) ‘field’ as a determined history of actions; (2) ‘habitus’ as a mode of collected actions; and (3) ‘practice’ as a situated action.

In this study, we focus on the design refinement process, which deals with how designers could interact with users in the design refinement process, and the sequence follows from field to habitus and to practice on the Bourdieu’s theory. The sequence of design refinement highlights how established design artifacts can be constructed or reconstructed by designer-user interaction. Design refinement follows a sequence from field to habitus, and on to practice. This design refinement sequence develops existing design problems, artifacts, and ideas through designer-user interactions in a design process. In previous studies, a few researchers have argued design refinement sequence on Bourdieu’s theory of practice. Levina (2005) argues the concept of boundary objects and boundary spanning, in which she utilized boundary objects as design outcomes and boundary spanning as the central stakeholder who has a certain higher capability in social, cultural, and symbolic capital and communicates with others effectively. In this research, Levina followed the sequence of design refinement (field → habitus → practice) in a design project. Schultz & Boland (2000) also study how habitus can be internalized by a social structure (field); how practice can be enacted from the habitus; and how this practice can construct or reconstruct the given social structure of Bourdieu’s theory of practice. Like these studies, the design refinement sequence by designer-user interaction improves the components of existing design artifacts; it defines design betterment by designer-user interaction in the design process.

Based on Bourdieu’s theory of practice, in this paper, we seek to understand the structure of designer-user interaction in the process of design refinement. This theoretical perspective will determine the structures of the generative interactions between designers and users by asking what actual interaction patterns exist in, and what design methods are applied for identifying users in the design refinement process.

4 METHODOLOGY

Data Collection and Analysis

This study collected twenty-seven design refinement project stories. To analyze them, we performed a grounded theory approach (Strauss & Corbin, 1990) as an analytic method. During this analysis, we highlighted the forms of designer-user interactions and their applied methods. During the data analysis process, we transformed all transcribed design project stories as visual process sequences to understand the micro dynamic patterns of how designer-user interaction went through a procedural path in creating design outcomes over time.

Figure 1 presents the data analysis process by the three steps of a grounded theory approach: from open, to axial, and to theoretical coding processes. In the open coding step, we reviewed every single line of the twenty-seven project narratives to clarify codes, themes, and memos in the transcribed project stories using Atlas.ti, qualitative research software. Also, we analyzed the designer-user interactions and the applied methods for a design refinement in the design project. Based on the open coding process, twenty seven process diagrams were synthesized, which represent the designer-user interactions and the applied design methods in the process of design projects in the axial coding step. In this step, we compared the similarities and differences and sought to categorize the twenty seven project diagrams. After the axial coding process, we performed a theoretical coding process to incorporate the given process diagrams to synthesize refinement patterns between designer-user interaction.
5 FINDINGS

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<tr>
<th>Patterns</th>
<th>Pattern Name</th>
<th>Sub-Pattern Name</th>
<th>Data (N)</th>
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<tr>
<td>Pattern 1</td>
<td>Problem-solving</td>
<td>Pattern 1.1</td>
<td>Identifying Problem-Solving</td>
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<td>Pattern 1.2</td>
<td>Problem-Solving with the Given Problems</td>
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<td>Pattern 2</td>
<td>Methods and Betterment</td>
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<td>Scenario Testing / Experiment/Simulation</td>
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<td>Pattern 2.2</td>
<td>Method Refinement</td>
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<td>Pattern 3</td>
<td>User-Testing</td>
<td>Pattern 3.1</td>
<td>User Testing with Multiple Prototypes</td>
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<td>Pattern 3.2</td>
<td>User Testing with Multiple People</td>
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<td>Three Designer-User Interaction Patterns with Six Sub-Patterns</td>
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As a result, Table 1 shows an overview of three designer-user interaction patterns in the design refinement process. The next 5.1 ~ 5.3 demonstrate the detailed patterns.

5.1 Refinement Pattern1: Problem-Solving

As Figure 2 represents, the refinement pattern 1.1 deals with designer-centered discovery cycle, and it describes how designer-user interaction can discover how to improve upon existing design products and services. A more detailed look at this pattern reveals that it cycles a linear interaction path of how designers can discover users and their information environment with more effective ways in the design planning stage. Then, they conducted designer-user interaction as mediation for understanding users’ hidden factors to identify design ideas and opportunities to synthesize a design-business impact in the design process.

A Project Story of Refinement Pattern 1.1

H Company's design project involves an example of refinement pattern 1.1 (Figure 3). The H Company is one of the biggest IT companies, which produces products, technologies, software, solutions and services to consumers. This is a project episode about their digital camera new product development.
The objective of this project was to create a new marketable user experience on H Company’s existing digital camera business area. As a project motivation, designers set up a project statement, which discovered new service factors for their digital camera solutions. Then, they built a design hypothesis for generating a design solution — the experience of scrap booking between children and parents (especially mothers) will provide unique product service experiences for users, and it would be marketable to expand current users’ experience as a new product definition.

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**Figure 3. Case of Refinement Pattern 1.1**

With this notion, designers planned to conduct ethnographic research in a local community. During this ethnographic research, as the core of designer-user interaction, designers observed that mothers and children used a digital camera within a scrap booking community. Also, the designers focused on current problems and the aspects of potential design ideas and opportunities. To understand more detailed contexts about user behaviors and their needs, they conducted focus group interviews to identify new service solutions for current digital cameras and their users.

Based on this ethnographic research, designers found that children’s behaviors and interactions were very different from that of the designers. First, children used most functions without requiring their parents’ helps. Second, they really wanted to share their photos and scrap books to various social media sites and communities. Therefore, designers created multiple functions and features for scrapbooking solutions and suggested a dynamic platform that users can share their digital scrapbooks as an expanded design service solution of current H Company’s digital camera.

As this project episode presents, the refinement pattern 1.1 demonstrates a usual cycle of how designers could discover new product factors with user interaction. As a well-defined user-centered design refinement cycle, this pattern shows how designers could use designer-user interaction to incorporate new user values to existing products and services in the design process.

5.1.1 **Pattern 1.2 Identifying Solutions from the Given Problems**

**Figure 4. Identifying Solutions from the Given Problems (Pattern 1.2)**

The refinement pattern 1.2 (Figure 4) illustrates two cycles of how designers could discover the given problems on existing projects and services. In this pattern, designers highlight the user interaction as the core to identify a system of problems and latent factors. These designers’ problem solving actions discover and validate problems with users. Through this process, designers can identify areas for improvement in design opportunities, solutions, and business impact in the design refinement process.

5.2 **Pattern2: Method and Betterment**

5.2.1 **Pattern 2.1: Method-Product Change**
As Figure 5 presents, the refinement 2.1 pattern illustrates how designer-centered design can develop user’s scenarios, which focus on user’s behaviors and interactions using designer’s indirect interactions with users. Based on designer’s understanding and imagination about users, designers identify design opportunities and then test, simulate, and experiment with them through direct user interactions to synthesize design suggestions and final solutions in a design refinement process.

5.2.1 **Pattern 2.2: Method-Process Change**

As Figure 6 presents, the refinement pattern 2.2 illustrates how designer-user interaction can complement the current design dilemmas with existing products or services. The existing design information and the patterns on products/services could encounter design dilemmas, and designer-user interactions would then be able to discover and validate the design issues while suggesting alternative suggestions and patterns in the design refinement process.

**A Project Story of Refinement Pattern 2.2**

Beta Inc.’s project story demonstrates an example of refinement pattern 2.2.

It deals with how the designer-user interaction could manage and amend a design dilemma in the new product development process. Beta Inc is a multinational corporation that produces footwear, apparel, equipment, and services focusing on the design, development and worldwide marketing. As a massively successful company, Beta Inc. already identified their design directions with nine different stereotypes of users, which defines their user behaviors and interactions. Yet, the Beta product developers and designers were curious whether the nine established segmentations would be useful in the process of their design process. Therefore, the Beta Inc. requested a design research project to Alpha design agency, a user experience design consulting firm.
The Alpha design agency conducted a design research project to evaluate the existing nine user segmentations and suggest new directions based on users’ life styles and patterns. First of all, the Alpha designers identified hypotheses about the existing user segmentations. To discover their hypotheses, designers invited thirty users as their qualitative research sample from three different countries and suggested for users to write a journey diary about their everyday activities and interactions. With the outcomes of users’ journey diaries, designers sought to validate their hypotheses and revealed reliable findings on Beta’s existing nine user segmentations.

Yet, the result of designer-user interaction (qualitative discovery) revealed that Beta’s existing user-segmentation was not practical, because it did not reflect on current users’ behaviors and interactions. Therefore, the Alpha designers polished their existing nine segmentations and suggested new patterns of user-lifestyles for the Beta designers and new project developers.

Refinement pattern 2.2 demonstrates how designer-user interaction could construct and reconstruct the existing design problems, dilemmas, or design ironies. Through this process of redefinition, designers might create alternative design methods or integrated patterns or frameworks.

5.3 **Pattern 3: User Testing**

5.3.1 **Pattern 3.1: User Testing with Multiple Prototypes**

As Figure 8 shows, the refinement pattern 3.1 demonstrates how designers can validate their different types of design concepts or prototypes with multiple direct user interactions as the core of designer-user interaction to synthesize a final, official version during a design process. This pattern includes two modes of designer-user interactions: (1) types of users’ design evaluations (UDE) and (2) users’ design ideas / suggestions (UDI) in the design validation process.

5.3.2 **Pattern 3.2: User Testing with Multiple People**

The refinement pattern 3.2 describes how designers’ concepts and prototypes can be validated by the multiple designer-user interactions to determine the current design-business opportunities and solutions. Especially, this pattern includes at least two times of designer-user interactions with different interaction methods. As Figure 9 shows, the first validation is performed by internal designers, in which designers act as users called ‘pre-skim test. The second validation is conducted by the direct interaction with real users.

_A Project Story of Refinement Pattern 3.2_
S mobile credit card project story shows an example of design refinement pattern 3.2 about how design ideas can be validated by multiple designer-user interaction methods (Figure 10). The S Company is a provider of mobile service in South Korea, with 50% of the market share. The S Company mobile project was to create a new payment mobile method by developing the current existing mobile cards.

In this project, designers developed design concepts and prototypes validate them with two different interaction methods to create an alternative mobile card. In the first validation, designers conducted the preskin test among designers. During the preskin test, designers acted as users to validate the different design ideas and prototypes by a view of users. As a result of this, designers created tasks and users’ journey processes on the current developed design prototypes or ideas.

Based on the first preskin test, designers conceptually validated users’ behaviors and interaction on the design ideas and prototypes. With this result, designer set up a qualitative simulation test to validate their qualified design concepts with real users. In this experiment, designers asked what types of alternative payment methods would be acceptable users concerning users’ mental models and life styles. To do this, designers utilized the card sorting and the live-building methods to clarify users’ preferences in the moments of payment. As a result, users’ behaviors and mental models made designers surprised, because users emotionally considered the other users and sellers. Therefore, they did not select the efficient payment methods. For example, in the simulation of movie theater payment situation, users did not select a special (optional) card to take additional discount because the other users were waiting because of me. Also, users did not select any credit cards as their payment tool in the traditional grocery markets, because they considered the sellers would prefer cash than credit cards. This qualitative simulation to validate design ideas and prototypes brought very different results and feedback that of designers’ preskin test. Consequently, designers decided to reconsider this project again at the end.

The refinement pattern 3.2 demonstrates how design ideas and prototypes can be validated by multiple designer-user interaction methods in the process of design refinement. This pattern shows the values of different interaction methods and how designers can create effective decision making to create a marketable design-business solution concerning user values in the design process.

6 CONCLUSIONS AND IMPLICATION

This proposes three refinement and six sub-patterns as designer-user interaction patterns in the design refinement process. These identified four designer-user innovation patterns interaction will open a research direction of how the generative interactions among multiple stakeholders can be empirically studied. Theoretically, this research demonstrates the importance of intangible interactions in creating better IS design artifacts and process as well. In addition, this research will also provide methodological and practical guidelines for the communities of ISD and three innovation research areas (IT, product, and digital innovation) in IS.
Theoretically, this research theorizes the complex interactions of two major stakeholders (designers and users) with a view of Bourdieu’s theory of practice to understand their interaction structure. Consequently, these interaction patterns between designers and users would give theoretical propositions for the communities of current three innovation communities (IT, product, and digital innovation) to rethink the followings of how IT innovation can be considered human-centered approach; how the product innovation can deeply invite users’ or customers’ voices and needs in the process of innovation; and how do the digital innovation can develop the platforms, balancing with the other innovation directions for users in the design process.

Methodologically, this study will overcome the gaps of existing design vocabularies from the three innovation studies, because the shifting business & design paradigm calls for more structural ways for identifying users and their information environments for the success in a market. Therefore, the major contribution of this study is to reveal their interactions with empirical evidence as an IS design project. Practically, practitioners of IS design artifacts and processes could understand the contexts of why and how the interactions between designers and users are interplayed with each other for identifying design outcomes in the design project. With a structural view, IS practitioners might recognize their everyday design activities of how / why they could invite, interact with, and co-create users in their everyday design projects.

References


