

IDENTIFYING A DYNAMIC INTERACTION MODEL: A VIEW FROM THE DESIGNER-USER INTERACTIONS

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ABSTRACT

Prior design innovation studies have discovered a variety of features, forms, and functions in the contexts of design artifacts; however, the importance of the design process has not been studied adequately. Also, the interaction of designers and users has been either neglected or separately highlighted in the literature on design process studies. The purpose of this study is to explore a designer-user interaction model in the process of design innovation. In order to address this, the following three roots of design interaction models are proposed: (1) interaction of designers, (2) interaction of users, and (3) mutual interaction between designers and users. Drawing from these three interactive models, this paper consequently identifies a dynamic design interaction model of designer-user interactions during a design project.

Keywords: designer-user interaction, a dynamic design interaction model, design innovation.

1 INTRODUCTION

The current design paradigm has shifted from *product-centered* to *experience-centered* [1-5]. The phenomena of experience-centered designs highlight the importance of designer-user interactions in the process of design innovations. User-Centered Design (UCD), Human Computer Interaction (HCI), and Computer Supported Cooperative Work (CSCW) concern the importance of designer-user interactions as the core issues of experience-centered design. However, these three research communities contain three limitations: first, previous researchers have regarded the interactions between designers and users as necessarily between different stakeholders; second, designer-user interactions have been developed through the different histories of design theories; and third, prior research has often been neglected or has separately considered designer-user interactions.

In order to address these research gaps, this paper theorizes a dynamic interaction model between designers and users that can be identified in the process of design innovations. To do this, three proposed interaction models are considered: interaction of designers, interaction of users, and mutual interaction between designers and users. The dynamic interaction model demonstrates how the interactions between designers and users can develop different types of design ideas and design artifacts. This model emphasizes the changing roles between a designer and a user with the following four modes: (1) a designer as a designer, (2) a designer as a user, (3) a user as a user, and (4) a user as a designer.

Three contributions can be summarized in this paper: (1) it provides a theoretical consideration of designer-user interactions in the process of design innovation, (2) it identifies a dynamic interaction model culled from three proposed designer-user interaction models, and (3) it highlights role-shifts between a designer and a user in order to facilitate better design outcomes during a design project.

2 DESIGNER-USER INTERACTIONS IN THE PROCESS OF DESIGN INNOVATIONS

Designer-user interactions have been considered in a variety of design research communities: Information Systems, Design Science, Participatory Design, Human Computer Interaction, Computer Supported Cooperative Work, and User-Centered Design. The research propositions and hypotheses of these research communities demonstrate how users can be more actively involved in the design process in order to synthesize better design outcomes. In order to do this, prior research highlights the techniques of anthropological approaches, the importance of user-lead innovations, and a variety of design methodologies stemming from user-centered design [1, 6-11]. However, they do not suggest a clear cut variety of theoretical models in order to understand how the dynamic phenomena of

designers' and users' interactions they encounter occur in a design sequence and evolve in the process of a design project.

2.1 The Interaction of Designers

Viewing the interaction of designers suggests three inter-related questions: What makes a designer a designer? What aspects characterize important factors of designers in an interactive design process? What are the primary designers' roles in a design project? These questions characterize three inter-related design actions: *design professionalism*, *understanding users*, and *design prototypes*.

The first designers' action concerns *design professionalism* as a fundamental designers' action. Few scholars highlight the *features* of design [12-14]; although, Buchanan and Margolin [13] define four spaces in design professionalism—two-dimensional design, three-dimensional design, interaction/system design, and service and design planning. On the other hand, design professionalism not only requires a series of detailed design skills, it also involves design logic that subsequently creates analytic and partly empirical knowledge in the process of design actions [14]. Therefore, design professionalism refers to a designer's requirement to perform as a designer.

The second designer's action accounts for *understanding users* as most important in the process of designers' interactions. Indeed, modern design underlines the importance of design analysis, and understanding users is the core concept of this trend. In design history, Nagy [15] highlights the importance of design analysis and identifies four design principles—design form, function, matters, and attitude. The questions of design analysis explore users' requirements and needs as design problems in the process of design.

The third designers' action represents design prototypes as the outcomes of designers' coordinating actions. Jones [16] indicates that designers encounter a variety of design conflicts in a design project, and that designers seek to coordinate these conflicts in order to move forward through different design stages. As design coordinators, designers utilize diverse levels of prototype techniques as professional design skills [17-18] between different types of designers or involved users in a design project. Therefore, the primary role of design prototypes is to understand the situated design conflicts and to develop the presented design issues by diverse design prototype techniques.

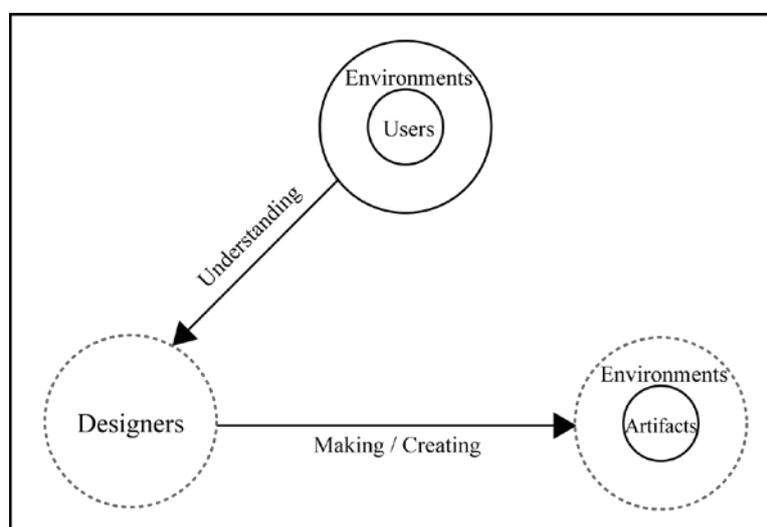


Figure 1. Interaction of Designers

Figure 1 shows a model for the interaction of designers, and it draws from the primary roles and actions of designers' interaction. The interaction of designers mainly consists of two actions in a design project—understanding a design environment and creating a design artifact. In addition, the actions of designers could identify the structure of a given design environment as one of two modes: a *fixed* or an *open* design environment.

The first designers' action is *to understand users from a fixed design environment*. The action to fix a design environment requires a set of information such as a clear mission statement,

competitive market research, design trends, new technologies, and design resource management. In this set of information, users are the most important factor to determine a fixed design environment in the early stage of a design project.

The second designers' action is *to create a new design artifact into an open design environment*. The action to create a new design artifact needs different types of designers' interactions in order to identify the design possibilities that emerge through design analysis and synthesis. To create a design artifact, designers utilize their prototype techniques and improve the quality of design outcomes in a design project. The design prototypes mean coordinating techniques to represent the designers' ideas, situated outcomes, and any new alternative ways over time. As a result, the finalized design artifact could reconstruct the existing design environment as an open environment for the next designers' interactions.

2.2 The Interaction of Users

Traditional client-based design approach has focused on the designer's capabilities and creativities in the process of design to create a reasonable design outcome. A design paradigm faces a shift from designers' creativity to user participation design; however, in prior research, users have not been adequately addressed within a design process. Recently, few design research areas in user participation design, user-centered design and user experience research have expanded the importance for users and their environments. Based on these problems and trends, three inter-related questions refer to the interaction of users: What make a user a user? What aspects characterize important factors of users? What are the primary users' roles in a design project? From these questions, three users' actions in the process of design are elucidated as follows: *a design paradigm shift, understanding design artifacts, and evaluation and feedback in a design process*.

The first users' action demonstrates *a design paradigm shift*. Redström [4-5] highlights the importance of users and refers to a design paradigm that proceeds from design forms and functions to interactions and experiences. The former design paradigm only relates to design forms and design functions to create a new design artifact, while the later one focuses more on interactions and experiences stemming from users of design environments and highlighting design logic, analysis, and design environments. Therefore, this design paradigm encompasses the interaction of users.

The second users' action--*understanding design artifacts* - is the most important users' action. Carroll [19-20] highlights the importance of design narratives in which designers as users can create heuristic design artifacts in user-centered design approaches. Carroll's argument indirectly points out the most important factor for the nature of users - users as designers. The most important factor for users is to understand current design artifacts by focusing on a design environment and providing design evaluations and feedback by imagining alternatives.

The third users' action -- *evaluation and feedback of users* - represents users' reactions to established design artifacts in the process of design. As Churchman [21-22] maintains, designers and users are two primary social actors in the process of design implementation. Users' actions are played out when they use a design artifact. The action of evaluation and feedback from users will offer different views to reconstruct existing design artifacts. Also, it expands users' actions from adapting to suggesting in the process of a design project.

In the action of evaluation and feedback, users reconstruct established design artifacts and construct emerging design environments in order to create a new design artifact. Therefore, users' design evaluations and feedback can generate new design ideas, problems, and possible solutions; they can then be incorporated into the designers' fixed design environment. In addition, the fixed design environment might be changed as an open design environment by the actions of users in the process of design.

In figure 2, we identify a model for the interaction of users. The interaction of users is to *understand* design artifacts as designers' outcomes and to *create* new design ideas in a design environment.

The first users' action is *to understand* a particular design environment in a design project, in which design artifacts are the primary factor for users to understand the design environment. On the

other hand, the second users' action is to *create* new design ideas by their evaluations and feedback in an open design environment, in which new design ideas could change the former design environments. In order to address the interaction of users, we identify two design modes of users in the process of design -- *users as users versus users as designers*. In the design process, the mode -- *users as users* -- is the fundamental action of users; they must adopt established design artifacts by asking how designers create that design artifact, which combines a variety of design forms and functions. The other mode presents *users as designer* and it illustrates the expanding action of users to evaluate or to suggest new design opportunities from a users' stand-point by asking how users can reconstruct an established design artifact. In this way, users conduct a role-reversal action, such as users as designers in a design project.

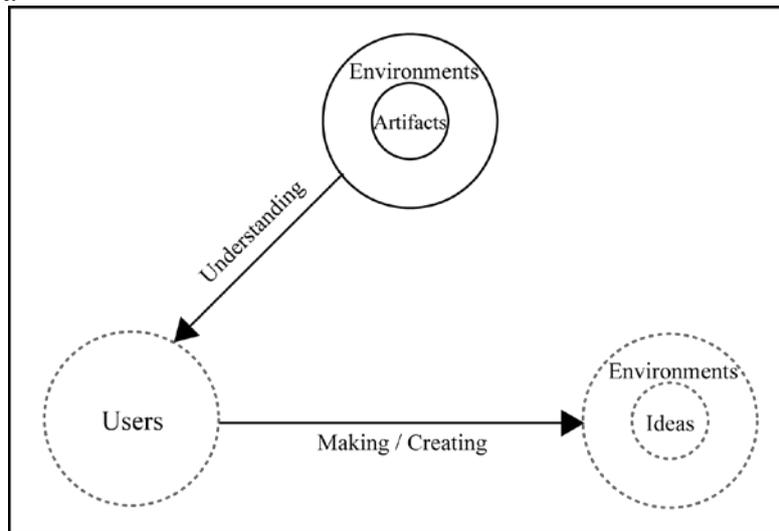


Figure 2. Interaction of Users

2.3 Mutual Interaction between Designers and Users

Interactions between designers and users characterize a model of mutual interaction between designers and users in the process of design. Figure 3 illustrates how the interactions between designers and users can be interplayed as a design routine in the process of design. From this mutual interaction model, three different episodes elucidate each design interaction that occurs in a design project.

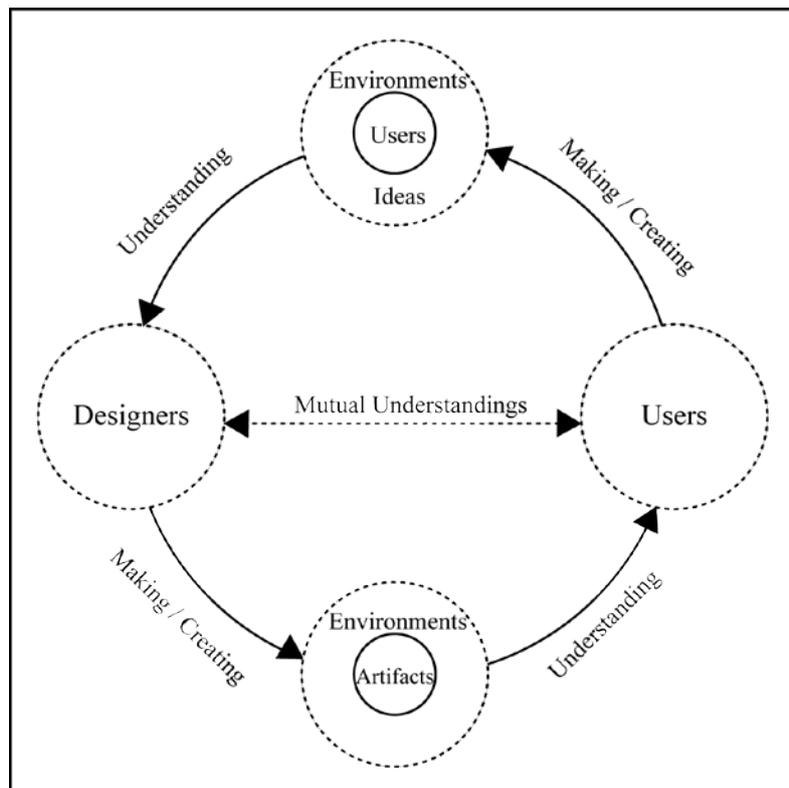


Figure 3. Mutual Interaction between Designers and Users

Episode 1: designers' interaction

Designers seek to identify a fixed design environment and to define users as a primary factor of the design environment. In order to address the issues of users within a design environment, designers utilize several design techniques, such as user observation, market analysis, and scenario planning to elicit design problems and requirements in the stages of design research and analysis. After the design research and analysis stages, designers clarify a conceptual design model with design criteria and principles to synthesize a design artifact. In the process of design implementation, designers suggest different types of design ideas, problems, and situated outcomes as design prototypes, and they negotiate a design outcome as a result of the design process. The new design artifact created by designers will have influence on a design environment as a primary factor. Also, the design artifact opens a design environment to communicate with the other design interactions in the process of design interaction.

Episode 2: users' interaction

Users seek to understand a new design artifact from the adopters' stand-point. As a primary factor, adopting a design artifact requires diverse users' actions to understand design forms, functions, and embedded services in a design environment. In the process of adopting a design artifact, users can suggest new design ideas through different types of design evaluation and feedback. The users' evaluation and feedback can change the conditions of the prior design environment from an artifact-centered design environment to a users' idea-centered design environment.

Episode 3: mutual interaction between designers and users

Interactions between designers and users encounter different types of design conflicts in a design project. The space of mutual interaction between designers and users is devised for more effective communication between designers and users in a design project, and there are two modes of mutual interaction: designers as users and users as designers. The role reversal between designers as users can define successful design stories in a design project. For example, the mode--designers as users—is encountered, when designers understand users' behaviors in the early stage of a design project. On the other hand, the mode--users as designers—will occur when users offer new design ideas based on their evaluation and feedback in a design project.

3 A DYNAMIC INTERACTION MODEL OF DESIGNER-USER INTERACTIONS

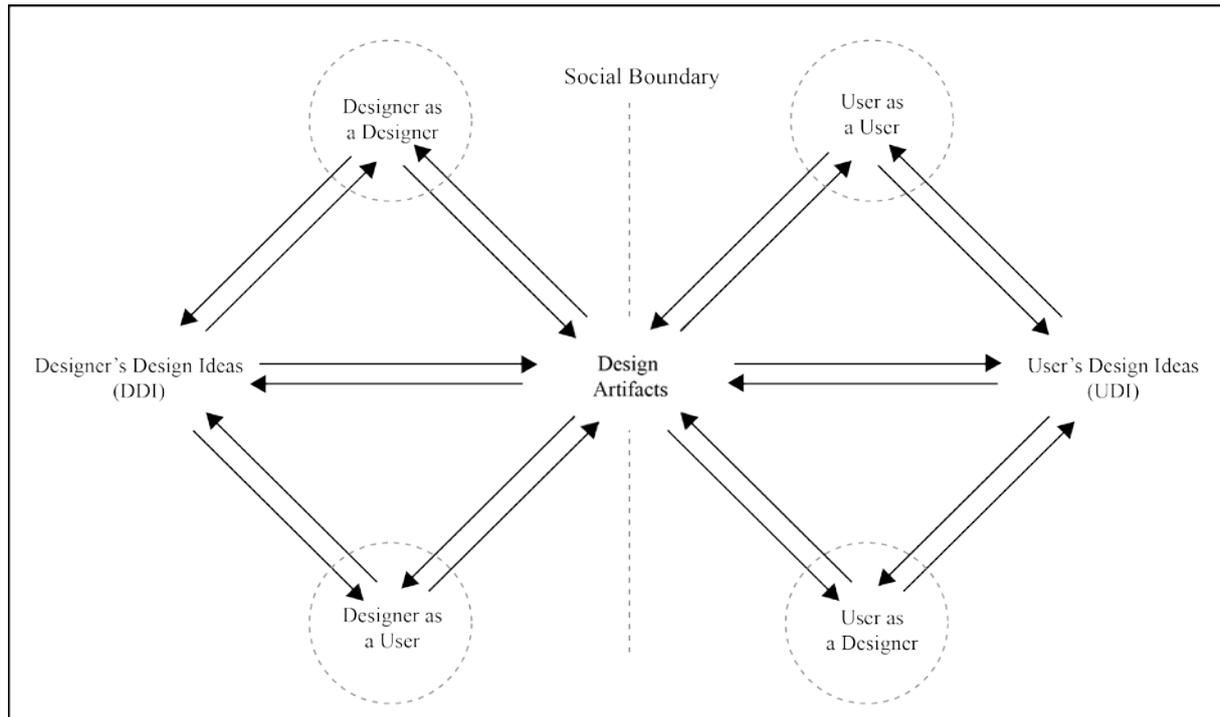


Figure 4. A Dynamic Interaction Model of Designer-User Interaction

Figure 4 reveals the different levels of designers and users design actions that can be identified in a design process. As a designer-user interaction model, it depicts the interactions of designers, users, and designers and users (figure1, figure2, and figure3).

As figure 4 shows, the model of designer-user interaction generates a variety of interactive paths between designers and users in a design project. This model explains different types of interactions that occur in the process of design. In order to address designer-user interaction, design is categorized by three design components: design idea, design process, and design artifact. Drawing from these three design components, design paths between designers and users create dynamic design in a design project.

Considering designers' interaction, when a designer takes design ideas, the designer's action creates two design modes: a designer as a designer and a designer as a user. In addition, the design idea itself can improve as a design artifact in a certain caste. Therefore, designers build the different types of design outcomes, effective design alternatives, and design ideas to create a new design artifact by taking a mode of designers' interaction in a design project.

When a user takes design ideas, the user's action also can generate two design modes: a user as a user and a user as a designer. Users' design ideas also directly produce a design outcome in a particular design situation. Through these design modes, users construct / reconstruct different types of design ideas, effective alternatives, and design outcomes by making a design mode of users' interaction.

Regarding a cycle of designer-user interactions, a design artifact can be identified by the mutual interaction between designers and users in a design process. Designers' and users' modes create dynamic routines of designer-user interactions and their collaboration shapes different design narratives in a design project based on different social boundaries between designers and users.

After conducting a cycle of designer-user interaction model, every construct of this model would be different. Through these multi-layered social interactions between designers and users in a design project, the quality of design artifacts would be developed, and the concept of *design maturity* is identified by the designer-user interaction.

4 IMPLICATION AND CONCLUSIONS

In this paper, the modes of designers and users are explored and three related design models (figure 1, 2, 3) characterize a designer-user interaction model (figure 4). These interaction models elucidate a design concept, design maturity. Several general discussions may be drawn upon from my work. First, the literature review on prior design research reveals research paucity in terms of designer-user interactions in a design project. This designer-user interaction model references dynamic design narratives and potential by presenting different interpretations between designers and users in a design project. Second, the proposed design maturity concept includes the meanings of dynamic interactive paths stemming from designers and users in a design project. The interactive paths combine different modes of interaction between designers and users. The modes can be indentified as follows: designer as designer, designer as users, user as designer, and user as user. Third, designer-user interaction model takes diverse potential for the community of design science research. This study combines theoretical interdisciplinary issues in information-centered design, decision-making and knowledge sharing between designers and users, and group dynamics among different social actors in a design process.

5 CHALLENGES AND LIMITATIONS

This study discovers interaction models between designers and users in a design project, and designer-user interaction research remains challenges and limitations.

This study involves theoretical approaches; however, it is not validated by any empirical studies. Therefore, future studies would test these interaction models with diverse propositions and hypotheses to validate this theoretical development of designer-user interaction. In addition, the proposed models can be interpreted differently. As an interpretive approach, this study takes a language view for the designer-user interaction. Because of this, other studies can take different subjective ways to identify the interaction between designers and users.

Therefore, further studies would be applicable to conduct empirical approaches by testing these proposed interaction models of designers and users by different interpretations.

REFERENCES

- [1] J. Buur, "Participatory innovation," *International Journal of Innovation Management*, vol. 12, p. 255, 2008.
- [2] J. Heskett, *Toothpicks and logos : design in everyday life*. Oxford: Oxford University Press, 2002.
- [3] J. Heskett, "Past, present, and future in design for industry," *Design Issues*, vol. 17, pp. 18-26, Win 2001.
- [4] J. Redström, "Towards user design? On the shift from object to user as the subject of design," *Design Studies*, vol. 27, p. 123, 2006.
- [5] J. Redstrom, "RE: Definitions of use," *Design Studies*, vol. 29, pp. 410-423, Jul 2008.
- [6] E. Von Hippel, "" Sticky information" and the locus of problem solving: Implications for innovation," *Management Science*, vol. 40, p. 429, 1994.
- [7] E. von Hippel, "The dominant role of users in the scientific instrument innovation process," *Research Policy*, vol. 5, pp. 212-239, 1976.
- [8] E. v. Hippel, *The sources of innovation*. New York; Oxford: Oxford University Press, 1988.
- [9] J. H. G. Hey, "Effective framing in design," 2008.
- [10] Kyng, "Designing for cooperation: cooperating in design," *Communications of the ACM*, vol. 34, p. 73, 1991.
- [11] P. Luff and C. Heath, *Documents and professional practice : Bad organisational reasons for good clinical records*, 1996.
- [12] R. Buchanan, "Wicked problems in design thinking," *Design Issues*, vol. 8, p. 5, 1992.
- [13] R. Buchanan and V. Margolin, *Discovering design : explorations in design studies*. Chicago: The University of Chicago Press, 1995.
- [14] H. A. Simon, *The sciences of the artificial*. Cambridge, Mass.: MIT Press, 1981.
- [15] L. Moholy-Nagy and D. M. Hoffmann, *The new vision, from material to architecture*. New York: Brewer, Warren & Putnam, inc., 1932.
- [16] J. C. Jones, *Design methods*. New York: John Wiley, 1992.

- [17] J. S. Gero and U. Kannengiesser, "The situated function-behaviour-structure framework," *Design Studies*, vol. 25, pp. 373-391, Jul 2004.
- [18] Gero, "Design prototypes: a knowledge representation schema for design," *AI Magazine*, p. 26, 1990.
- [19] J. M. Carroll and P. A. Swatman, "Structured-case: a methodological framework for building theory in information systems research," *European Journal of Information Systems*, vol. 9, pp. 235-242, Dec 2000.
- [20] J. M. Carroll, "Dimensions of participation in Simon's design," *Design Issues*, vol. 22, pp. 3-18, Spr 2006.
- [21] C. W. Churchman, *The systems approach*. New York: Delta Books, 1968.
- [22] C. W. Churchman, "Commentary on" The Researcher and the Manager: A Dialectic of Implementation", *Management Science*, vol. 12, p. 2, 1965.

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