

## DUAL NATURE OF DESIGNER'S ATTITUDES TOWARD DESIGN-LED INNOVATION

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These Design has become important to corporate competitiveness. Studies on design have paid much attention to innovation (Von Stamm, 2003; Utterback et al., 2006). A growing number of scholars see the design as the driver of the innovation, and two key ideas has gathering attention. One is the concept of "HCD (Human-Centered-Design)" and "Design Thinking" (Brown, 2008, Martin, 2009), and the other is the concept of "DDI (Design-Driven Innovation)" (Verganti, 2009). However, there is tension between two deterministic views of design-led innovation. On one hand, design is seen as a creative problem-solving activity that works towards a desired state of affairs that can be determined in advance. On the other hand, design is seen as exploratory research through which an understanding of an issue or problem emerges.

This paper investigates the contribution of the designer's attitude relating to problem-solving/exploratory research, and provides conceptual framework that explain relations between dual nature of designer's attitude and design-led innovation.

keywords: Design-Driven Innovation, Human-Centered Design, Design Attitude, Grounded theory approach

### Introduction

Nowadays, Design has attracted attention among practitioners and scholars as the sources of innovation (Bruce & Bessant, 2002; Von Stamm, 2003; Utterback et al., 2006; Verganti, 2008; 2009; Stevens & Moultrie, 2011). A growing number of scholars see the design as the driver of the innovation, and two key ideas has gathering attention.

One is the concept of "HCD (Human-Centered-Design)" and "Design Thinking" (Kelly & Littman, 2005; Brown, 2008, 2009; Dune & Martin, 2006; Martin, 2009). HCD and Design thinking is most popular method for the human centered approach toward innovation. These creative problem-solving activity usually characterized by observation, ideation, prototyping and testing (e.g. Brown, 2008; Liedtka & Ogilvie, 2011), and these methods drive innovation by human-centered view.

Another is the concept of "DDI (Design-Driven Innovation)". Verganti (2009) proposed the idea of Design-Driven Innovation, considering design the right approach to move the innovation process on another dimension: the meaning of the products or services. This theory originates from the comprehension of subtle dynamics in socio-cultural models, resulting in the proposal of radically new meanings and languages (Dell'Era & Verganti, 2007; Verganti, 2009). This approach to innovation shifts the attention from the solution to the reason why customers use and love a product or a service. The meaning defines why a product is used, not how it is used (Verganti, 2009; 2011).

But, these two design-led innovation concepts are different from each other in terms of nature of innovation, "radical" and "incremental" (Norman & Verganti, 2010). While Incremental innovation comes from improvements within a given frame of solutions, radical innovation comes from change of frame. Norman & Verganti (2014) said, "HCD and Design Thinking methods are a method of hill-climbing, getting to the top of the current hill, and thereby are well



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suitable for continuous incremental improvements, but incapable of radical innovation—finding the highest hill. Radical innovation, finding a higher hill, comes about only through meaning or technology change” and “Radical innovation driven by meaning change can also be design-driven through a better understanding of potential patterns of meanings.” (Norman & Verganti, 2014: 93).

In this way, there is tension between two deterministic views of design-led innovation. On one hand, design activity is seen as a creative problem-solving activity (e.g. Brown, 2008; Plattner et al. 2009) that works towards a desired state of affairs that can be determined in advance. On the other hand, design is seen as exploratory research through which an understanding of an issue or problem emerges (e.g. Utterback et al., 2006; Dell’Era & Verganti, 2007; Verganti 2009; Dorst, 2015).

From the above perspectives, we consider that design has two types of essence and designers have two types of attitude. When we view design in terms of a designer’s attitude and values, we are considering the effect of the concept of design attitude (Boland & Collopy, 2004). The design attitude refers to the attitude and culture of the designer, design organization and design profession, compared with the attitude of the manager making a decision and analytical techniques (Boland & Collopy, 2004; Michilewski, 2008, 2015). In recent work in the field of design management, the design attitude has been shown to contribute to innovation projects in several sectors (New & Kimbell, 2013; Amatullo, 2015); however, the design attitude has not been clearly tied to a design-led innovation.

This paper therefore investigates the contribution of the designer’s attitude relating to problem-solving/exploratory research to the creation of new value, and provides conceptual framework that explain relations between dual nature of designer’s attitude and design-led innovation.

## **2. Review of the relevant literature and the research problem**

This section presents a review of the three relevant literature especially focusing on the concept of HCD, DDI and Design Attitudes.

### *2.1 Human-Centered Design & Design Thinking*

Several themes of design-led innovation have been researched and begun to take shape; one of the main research theme is HCD and Design Thinking (Kelly & Littman, 2005; Brown, 2008,2009; Dune & Martin, 2006; Martin, 2009; Plattner et al., 2009). Design thinking is a method of problem-solving and teamwork for innovation and equally relevant to designing products and spaces as it is to designing systems and services (Brown, 2009). Lockwood (2009) offered a detailed definition of design thinking: “a human-centered innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping, concurrent business analysis”(Lockwood, 2009). The primary goal of design thinking is to realize a disruptive innovation and competitive advantage.

Design thinking is characterized as human-centered design, not technology-centered, and it is an approach taken not only by the designer but also by the project worker. On the other hand, Norman & Verganti (2014) pointed out that characteristic of HCD is iterative incremental improvement, and it is difficult to drive radical innovation. Because HCD is focusing on user’s perspective, therefore can not leave existing meanings.

Similarly, some authors pointed out that the matter of meanings creation has rarely be mentioned in the concept of design thinking (Johansson-Sköldberg et al., 2013).

### *2.2 Design-Driven Innovation*

Meanwhile, Several studies have considered design to be an exploratory activity rather than a problem-solving activity (Dunne & Raby, 2013; Dorst, 2015), and designer interpret the stakeholder’s culture and framed the stakeholder’s viewpoints and meanings (Verganti, 2009).

Technology evolution is not always enough to explain the drivers behind some great market successes, there was the need to complement the existing theories considering another approach to innovation: the meaning of products and services. Verganti (2008, 2009) shows how well developed theories on technology management can therefore be useful to investigate another kind of radical innovation, using design as the trigger element.

Verganti (2009) proposed the idea of Design-Driven Innovation, considering design the right approach to move the innovation process on another dimension: the meaning of the products or services. This theory originates from the comprehension of subtle dynamics in socio-cultural models, resulting in the proposal of radically new meanings and languages. It is a pushing innovation that changes completely the meaning of a product, a breakthrough with a high chance of diffusion in the future society (Verganti, 2011; Baha et al., 2013). This approach to innovation shifts the attention from the solution to the reason why customers use and love a product or a service. The meaning defines why a product is used, not how it is used. The radical innovation of meaning is a change in the interpretative paradigm of what make sense, both from the innovating company’s point of view (they see a change of their strategic vision)

and from the customer's point of view (that sees a change in the purposes). In other words, a new meaning is not achieved thinking creatively: it shall also come from an interaction with the society and mainly with the interpreters (Verganti and Oberg, 2013). The interpreters are actors of other businesses who pursue similar investigations on the same meaning; with the innovating company exchanges many kinds of information with them, being engaged in a continuous mutual dialogue. In the concept of DDI, design means "making sense (of things)" (Krippendorff, 1989).

### 2.3 Design Attitude

In the area of design management study, there are two distinct discourse in terms of design thinking (Johansson-Sköldberg et al., 2013). One called "designerly thinking": This refers to the academic construction of the professional designer's practice (practical skills and competence) and theoretical reflections around how to interpret and characterize this non-verbal competence of the designers (Johansson-Sköldberg et al., 2013; 123). Another discourse is above mentioned the methods of design thinking.

Some authors see design as an element of change management, and maintained that designer's way of reasoning are useful for managers. Boland & Collopy (2004) talked about "Design attitude", that refers to the attitude and culture of the designer, design organization and design profession, compared with the attitude of the manager making a decision and analytical techniques (Boland & Collopy, 2004; Michilewski, 2008). Boland & Collopy (2004) define design attitude as "expectation and orientation one brings to a design project" (Boland & Collopy, 2004; 9). In recent work, Michilewski (2008; 2015) did qualitative study to reveal the elements of design attitude, and proposed several elements. He thought that the design attitude is "character of a professional culture shaped by designers", and designer shared same attitude from their profession. In addition, the design attitude has been shown to contribute to innovative projects in several sectors (New & Kimbell, 2013; Amatullo, 2015). As shown in table 1, the design attitude has various concepts and items from each scholar's view (Table 1). The design attitude is

However, the design attitude has not been clearly tied to a capability toward design-led innovation.

### 2.4 Research problem

From the above literature review, there is tension between two deterministic views of design-led innovation: radical or incremental. In this point, we consider that design has two types of essence and designers have two types of attitude. On one hand, design activity is seen as a creative problem-solving activity (e.g. Brown, 2008; Plattner et al. 2009) that works towards a desired state of affairs that can be determined in advance. On the other hand, design is seen as exploratory research through which an understanding of an issue or problem emerges (e.g. Utterback et al., 2006; Dell'Era & Verganti, 2007; Verganti 2009; Dorst, 2015). However, the nature of each design attitude has not been clearly tied to a capability toward design-led innovation.

Present study therefore investigates the contribution of the designer's attitude relating to problem-solving/exploratory research to the creation of new value, and provides conceptual framework that explain relations between dual nature of designer's attitude and design-led innovation.

Table 1 Design attitude conceptualization in the literature.

Literature	Boland & Collopy (2004) <i>"Managing as Designing"</i>	Michlewski (2015) <i>"Design Attitude"</i>	Amatullo (2015) <i>"Design attitude and social innovation"</i>
Concept and Definition	<i>"Expectations and orientations one brings to a design project"</i>	<i>"Character of a professional culture shaped by designers"</i>	<i>"A set of abilities that impact innovation and organizational learning"</i>
Attribute	Design attitude for Managing	Design attitude for Organizational Learning	Design attitude for Social Innovation
Items of design attitude	Liquid and open orientation to project;  1) Invention of new alternative	1) Embracing Uncertainty and Ambiguity  2) Engaging Deep Empathy	1) Connecting Multiple Perspective  2) Creativity

2) Questioning of assumption	3) Embracing the Power of the Five Senses	3) Empathy
3) Resolve to contribute to human betterment	4) Playfully Bringing Things to Life	4) Engagement with Aesthetics
	5) Creating New Meanings from Complexity	5) Ambiguity Tolerance

### 3. Research design

#### 3.1 Research method

From the above view points, we did the empirical study which investigates the contributions of the designer's attitudes of problem-solving and exploratory research to design-led innovation. The choice of companies and designers made in the present study was deliberately diverse from a viewpoint of organizational structure. Because a close study of investigating the effects of the organizational structure and the diversity of the elements of the designer's attitude is necessary for our purpose. In this study, six Japanese companies and three freelance designers were thus chosen (Table 3). Organization A is a design consultancy, whose main work is branding. The organization is involved in all phases of design, such as developing a brand strategy for products and services. Organization B is a design studio that specializes in product design and graphic design. Organizations C to E are in-house design departments designing medical, mobility and industrial equipment. Organizations G to I are freelance designers of products and services.

We employed the grounded theory approach (Glaser & Strauss, 1967) to sample data.

Table 2 Data sources.

Organization	Profile	Data Sources
A	Design consultancy	3 interviews: creative director, chief consultant, chief designer
B	Design studio	2 interviews: creative director, designer
C	In-house product design department	3 interviews: general manager, senior designer, chief designer
D	In-house mobility design section	2 interviews: senior staff officer, designer
E	In-house industrial design department	1 interview: chief specialist of industrial design
F	In-house product design department	2 interviews: principal researcher, senior staff
G	Freelance designer	1 interview: design director
H	Freelance designer	1 interview: art director
I	Freelance designer	1 interview: designer

#### 3.2 ANALYSIS PROCEDURE

To extract the essence of the designer's attitude and factors that formed the attitude, we carried out 13 in-depth interviews between September 2015 and January 2016. Each designer had a career lasting more than 10 years. Each interview lasted from 50 minutes to 2 hours. A final sample of the respondent's data is shown in Table 3 (Table3).

The analysis process was as follows. We first extracted fragments of replies that mentioned the respondent's attitude. We then produced a short statement that summarized the fragment of text. A total of 116 different codes were used in coding the statements. From these coding labels, six high-level concepts that spanned all responses were created. After labeling each design attitude, we obtained the overall picture from the relationships of each category.

Finally, six categories of the designer's attitude were constructed. Examination of coding process is shown in Figure 1.

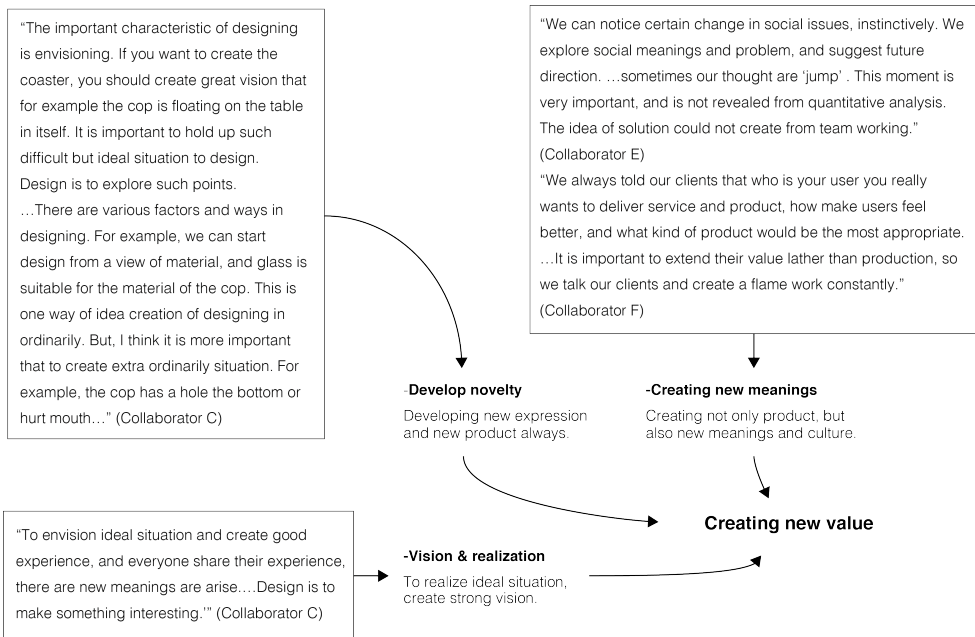


Figure 1 An example of category-building process

Table 3 Sample of respondents' data.

Collaborators	Age	Sex	Position	Career	Area of Design
A	50	Female	AD, D	30	Public Design, Sign Design
B	50	Female	AD, D	30	Product Design, Graphic Design
C	40	Male	AD, D	20	Product Design, Graphic Design
D	50	Male	D	30	Product Design
E	40	Male	D	20	Product Design, Service Design
F	40	Male	D	15	Product Design, Service Design
G	60	Male	CD, D	35	Product Design, Service Design
H	60	Male	DM	35	Marketing, Design Management
I	50	Male	D	25	Industrial Design
J	40	Male	D	20	Product Design
K	50	Female	D	30	Product Design
L	40	Male	AD, D	15	Product Design, Service Design
M	40	Male	D	15	Interior Design, Product Design

AD: Art director, CD: Creative director, D: Designer, DM: Design manager

#### 4. Data analysis

This section presents results obtained employing the grounded theory approach, particularly results for the essences of a designer's attitude and the formation factors of their attitudes.

##### Creating new value

The first category of the designer's attitude is creating new value. Some respondents mentioned that a characteristic of designing is envisioning and realization, and that they pay much attention to novelty. Moreover, some thought that their design problems are not well defined and need to be explored. After exploring the fundamental factors of the social problem that they are present with, they create new meanings through design. One of the respondents said:

*"The important characteristic of designing is envisioning. If you want to create the coaster, you should create great vision that for example the cop is floating on the table in itself. It is important to hold up such difficult but ideal situation to design. Design is to explore such points.*

...There are various factors and ways in designing. For example, we can start design from a view of material, and glass is suitable for the material of the cop. This is one way of idea creation of designing in ordinarily. But, I think it is more important that to create extra ordinarily situation. For example, the cop has a hole the bottom or hurt mouth..." (Collaborator C)

The respondent referred to the importance of envisioning and exploring new meanings.

*"To envision ideal situation and create good experience, and everyone share their experience, there are new meanings are arise. ...Design is to make something interesting."* (Collaborator C)

Other respondents reported a similar essence of their attitude. One of the respondents referred to the moment of creating an idea as a 'jump'.

*"We can notice certain change in social issues, instinctively. We explore social meanings and problem, and suggest future direction. ...sometimes our thought are 'jump'. This moment is very important, and is not revealed from quantitative analysis. The idea of solution could not create from team working."* (Collaborator E)

*"We always told our clients that who is your user you really wants to deliver service and product, how make users feel better, and what kind of product would be the most appropriate. ...It is important to extend their value lather than production, so we talk our clients and create a flame work constantly."* (Collaborator F)

Dorst & Cross (2001) noted that designers interpret a design problem individually, present an original concept and pass between the problem space and solution space via a continuing iteration of analysis, synthesis and evaluation. Our interviews revealed the same characteristics. Collaborators C and E both emphasized exploration in designing, and that the solution concepts are original to the individual designer and are not produced through teamwork.

In addition, Collaborator I referred to the importance of creating new meanings.

*"Create new meanings is to designing a number of people's behaviour. We try to have a deep empathy to the human behaviour, for example, why people drink water and why they behave variously. From these viewpoints, we should do inverse process that compared with engineering process. There are a few products created from these process and success cases in the worlds, however we call these cases as innovation."* (Collaborator I)

Some innovation management studies have stated that the designer is a cultural interpreter (Utterback et al., 2006; Verganti, 2009). From the viewpoint of design is making sense of things (Krippendorff, 1989), a designer must not only create products that have shapes and colors but also create value that can be appreciated by the actor involved (Utterback et al., 2006; Verganti, 2009).

The concept of creating new value emphasizes the designer's attitude and role in exploring new values and creating a new framework.

### **Bringing joy**

The second category of a designer's attitude is bringing joy. Some respondents mentioned the true nature of value and the most essential purpose of design. They stated that design is the process of surprising clients and users and bringing joy into people's lives, thus creating a better experience.

One of the respondents said:

*"To explore social issues and to make people think problem around here is important for the art, however most important essence of design is to bring a joy rather. Good design gives people fun, comfortable and pleasure."* (Collaborator C)

After the respondent referred to the difference between design and art, he mentioned the importance of providing people with something akin to fun or comfort. Other respondents reported a similar essence of their attitude.

*"Design's most fundamental purpose is making people happy."* (Collaborator A)

Several papers in the design field have mentioned the difference between design and art (Olins, 1986; Johansson-Sköldberg, 2013). This literature highlights that design is based on art but is more focused on problem-solving engineering-based activity. Meanwhile, some literature has mentioned and argued that design based on creativity and art has been overlooked in recent studies in the design field (Johansson-Sköldberg, 2013; Soila-Wadman, 2013). Additionally, some respondents in the present study referred to the purpose of giving joy more than the purpose of solving a problem as an aspect of design.

In response to the question of how designers provide people with joy, one respondent said:

*“Product is media for bring message and experience into users, so product are needed.*

*···I have tried branding to the clients company just this week. In this work, we approached to create ‘perfume’ as part of branding because for the reason represent clients value.” (Collaborator F)*

The respondent considered a product as a vehicle for carrying the design experience. Another respondent reported the aspect of the design experience:

*“Having the opportunity to talk the story of user’s experiences many times is important. We create product and service from a view of what they have as their own story into the use of product. I think this process is necessary for design, and thinking most fundamental points of user’s pleasure. Designing is needed not only aspect of product novelty but also aspect of brining a joy. I am trying to connect user’s story and client’s story from service to package, always.” (Collaborator G)*

The respondent referred to the importance of exploring the story of the clients and users, and creating better experiences by connecting their own stories. Collaborator F said that a product is a medium for providing a message and experience; indeed, a perfume can be considered a product used to convey the client’s story to users.

The concept of bringing joy emphasizes a design’s natural value and the essence of the designer’s attitude to provide people with a fun experience or comfort by creating a product or service as a vehicle that carries the design experience.

### **Logicity**

The third category of the designer’s attitude is logicity. All respondents referred to some kind of logicity, and in particular, they mentioned the process of problem-solving activity.

One of the respondents said:

*“Product form has fixed logic, and should not be create from incidence....We are not artist. We should do designing for the problem-solving. The logicity is necessary for the product form. This attitude is educated the time I was entered in the first company. (Collaborator A)*

The respondent said that the purpose of design is to solve a problem, and logicity is necessary for design. In addition, she said that logicity is an important essence of styling the form of a product.

Other respondents similarly mentioned the essence of problem-solving logic:

*“Problem-solving process is important for designing, and form is decided after the logic. ···The work of designer and art director is to make a logic and express aesthetics form” (Collaborator C)*

Collaborator C referred to the importance of the process of problem-solving. He said that designing can be characterized as making logic, and the activity of styling products begins after the logic is fixed. The perspective of problem-solving has long been a main idea in the fields of design and social science (Schön, 1983; Cross, 1984; Simon, 1984). Design is conceived as part of problem-solving activity, and the aim of the problem-solving approach is to realize what has already been conceived. However, the above category of creating new value is more similar to framing and exploring activity than to problem-solving.

About this point, one of the respondents referred to two different approaches.

*“I think design is consists two different part. One is gathering information for explore social problem, and other is organizing information for problem-solving. We can propose good solution if we could find way of gathering information.”(Collaborator F)*

The respondent mentioned that a designer conducts two different activities and has associated abilities such as gathering and organizing information.

In the literature on design management, studies have mentioned that a designer plays the role of a facilitator and integrator, and that the organizing of information requires a designer's ability to organize (Press & Cooper, 2003; Perks et al., 2005).

### **Engage deep empathy**

The fourth concept of a designer's attitude is achieving deep empathy. This category has the three main subcategories relating to the view of the professional/ user, accepting a phenomenon, and honesty.

One of the respondents said:

*"We try to engage deep empathy. I see the things from a various view to understand the true nature of the problem." (Collaborator G)*

All respondents referred to the some kind of essence relating to achieving deep empathy, but their approaches to the problem varied. One of the respondents said:

*"I have different two viewpoint, one is professional view and other is user's. I see the phenomena through the each glass of professional and user. " (Collaborator A)*

*"It is important to be honest to the real problem. Before designing, I investigate the information of the problem and prepare previously. If I have already some idea for similar problem, I can't see real essence. I attempt to observe natural phenomena, not to look at problem through colored spectacles." (Collaborator A)*

The respondent said she has two different views. One is a professional view while the other is a user's view that allows a solution that is closer to a natural phenomenon to be realized. In addition, she thinks that it is important to engage with the essence of a problem as much as possible.

Collaborator G had a similar attitude:

*"I sometimes propose the idea that rather than what is not along with clients needs because clients doesn't know their fundamental problem.*

*...this idea is not along with clients needs, but I think that is not honest to the clients and users."(Collaborator G)*

Collaborator G referred to a different aspect of this category. He attempted to be honest with the clients and to address the user's real needs.

This category of the designer's attitude is similar to the idea of human-centered design (Brown, 2008; Plattner et al., 2009). Human-centered activity is in contrast to technology-centered activity (Krippendorff, 2006), and human-centered design is represented by the approach of design thinking. In our research, achieving deep empathy is categorized as a professional attitude toward problem-solving.

### **Contributing to society**

The fifth essence of a designer's attitude is contributing to society. Almost all respondents referred to this attitude, and they stated that a designer must pay mind to society.

Collaborators A and C said:

*"We are not artist, so we should have the service mind to contributing the society. You don't have to create anything only for the mass, but ideal situation is sharing among all people....I have taught that to ask whether my idea have social meaning to my heart." (Collaborator A)*

*"The most important work of art director is bringing client's statement to people thorough our sense, so we need service mind to involve society."(Collaborator C)*



Studies have shown that this attitude is an essence of professionalism (Wilensky, 1964; Hall, 1968). The literature mentions that a belief of contributing to society and the service mindset are important to professionalism (Elliott, 1972; Freidson, 1986).

### **Engaging aesthetics**

The final category of a designer’s attitude is aesthetics, which is the category that we find to be the most simple and understandable. All respondents mentioned this category.

*“Of course aesthetics is most important. It is base of our activity. I ask whether it is beautiful or not to my heart. (Collaborator J)”*

Several studies have mentioned the relationship between aesthetics and innovation. The designer engages aesthetics in contrast to engaging technology (Verganti, 2009), and emphasizes the creation of aesthetically pleasing novelty in product and industrial design practice (Manzini, 2003).

## **5. Summary and Discussion**

### **5.1 Dual nature model of Designer’s attitude**

The present study investigated the designer’s attitudes of problem-solving and exploratory research. This section discusses the results of the investigations and questions that arise from the analysis of results.

First, through the expiring designer’s attitude research, we extend six essences of designer’s attitude (Figure 2).

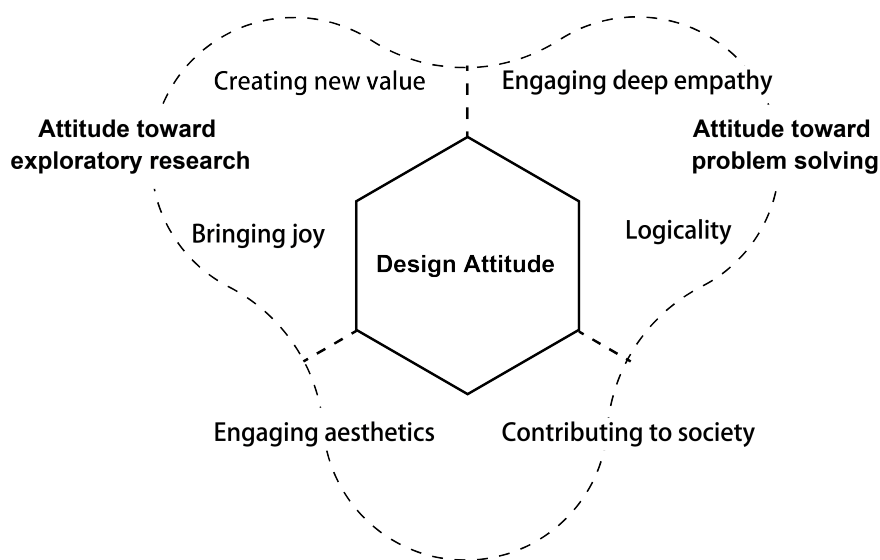


Figure 2 Designer’s attitudes of exploratory research and problem-solving in this research.

- (1) Creating new value—emphasis on the designer’s attitude and role in exploring new values and creating a new framework.
- (2) Bringing joy—emphasis on the design’s natural value and essence of the designer’s attitude of providing people with a fun or comforting experience by creating products and services as a vehicle that carries the design experience.
- (3) Logicity—emphasis on the designer’s attitude of logicity subordinated with problem-solving activity.
- (4) Engaging deep empathy—emphasis on the designer’s attitude and the way of approaching a problem.
- (5) Contributing to society—emphasis on the designer’s belief of contributing to society and having a service mindset.
- (6) Engaging aesthetics—emphasis on the designer’s attitude for aesthetics.

We found five formation factors for the attitude of exploratory research. In the case of *creating new value*, the designer is a specialist who envisions the ideal situation and pays much attention to *novelty*. The problem that the designer attempts to solve has not been well defined and should be explored. By exploring the fundamental factors of

the social problem, the designer creates new meanings through design. In the case of *bringing joy*, the designer surprises clients and users and brings joy to people's lives through their activity of creating a better experience.

Moreover, we found five formation factors for the attitude of problem-solving. In the case of *logicality* and *engaging deep empathy*, the designer engages in problem-solving activity. The designer begins the design process by *accepting natural phenomena* using their *view of the professional/user* differently to act *honestly* in addressing the real problem.

The listed attitudes do not cover all aspects of design but are considered to capture a wide range of essences of the design attitude. Returning to the main aim of the present study, we consider that this is a "dual nature" of a designer's attitudes for exploratory research and problem-solving; specifically, the concepts of creating new value and bringing joy relate to exploratory research while the concepts of logicality and achieving deep empathy relate to problem-solving (Table 4, 5).

As the different point from previous study, "Logicality" and "Contributing to society" are built as categories. The category of "Creating new value", "Bringing joy" and "Engaging deep empathy" are similar to the results of Micilewski (2015)'s, and "Engaging aesthetics" is similar to the Amatullo (2015)'s definition. Obviously designer's professional background is generally art, and they are expert of the creation of aesthetically pleasing novelty. In addition, as is the case with other professional, designer have professional belief for the contributing society and the service. In this way, these two categories are more similar to the their professionalism.

Some author pointed out that designer see ambiguity as the source of creativity, and their attitude toward ambiguity is different from manager's (Boland & Collopy, 2004; New & Kimbell, 2013). The category of "Embracing Uncertainty and Ambiguity" (Micilewski, 2015) is not built from our research, and on the other hand, the category of logicality is built. The logicality is, in other words, appropriateness. While designer explore the novelty and create meanings, they should also express the idea as the logically form. Through creating new value to forming product and information logically, designer cleverly manage uncertainly and ambiguity.

Table 4 Designer's Attitude toward Problem-solving.

Category	Sub-category	Definition
Creating new value	Develop novelty	Developing new expression and new product always.
	Vision & realization	To realize ideal situation, create strong vision.
	Creating new meanings	Creating not only product, but also new meanings and culture
Bringing joy	Giving surprise	Giving clients and users comfort, pleasure and interest.
	Create better experience	Bringing joy to people, create better experience in all phase of user experience.

Table 5 Designer's Attitude toward Exploratory research.

Category	Sub-category	Definition
Engaging deep empathy	View of Professional/ User	Addressing as end-user, not professional.
	Accept phenomenon	Accepting phenomenon sincerely
	Honesty	Having the honesty to clients, users, and him/herself.
Logicality	Problem-solving logic	Emphasize logic of problem-solving and express in a logistical form.
	Importance of process	Emphasize process of design to

### 5.2 Dual nature of designer's attitude toward design-led innovation

From our research, we illustrated the concept framework of the dual nature of designer's attitude toward design-led innovation from present study (Figure 3)

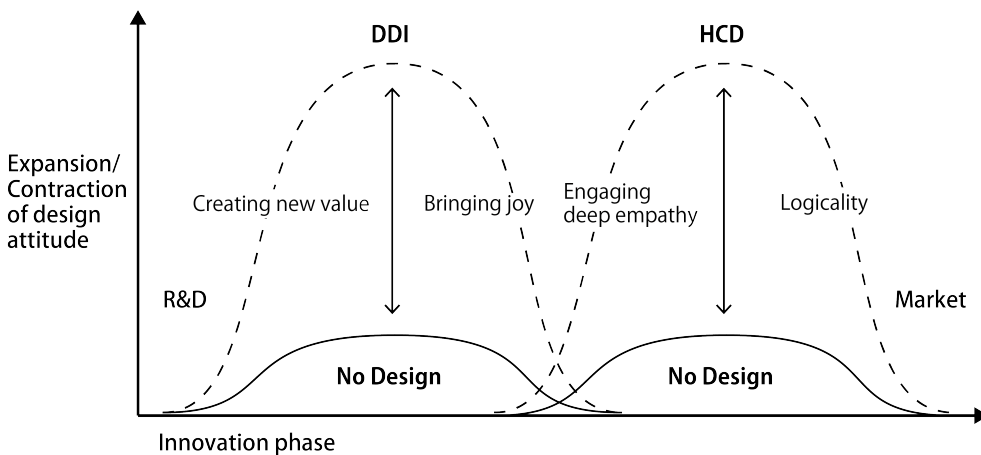


Figure 3 Framework of Expansion/contraction of designer's attitude in the innovation project.

This figure shows the relations between dual nature of designer's attitude and different two kind of design-led innovation; HCD and DDI. Norman & Verganti (2014) said, "Radical innovation driven by meaning change can also be design-driven through a better understanding of potential patterns of meanings. This understanding can emerge through research and observations rooted in more general socio-cultural changes, as an understanding of how society and culture are changing." (Norman & Verganti, 2014).

In our research, "Creating new value", "Bringing joy" is categorized as a professional attitude toward exploratory research. Some innovation management studies have stated that the designer is a cultural interpreter (Utterback et al., 2006; Verganti, 2009). Designers activity on the left side is exploring the meanings in the socio-cultural change, and bringing more joyful concept to the project.

On the other hand, in the right side, designer engages in problem-solving activity. Human-centered activity is in contrast to technology-centered activity, and human-centered design is represented by the approach of design thinking. In our research, engaging deep empathy is categorized as a professional attitude toward problem-solving. On the right side, designer begins the design process by accepting natural phenomena using their view of the professional/user differently to act honestly in addressing the real problem. In addition, designer plays the role of a facilitator and integrator, and organizing of information as logically form. These categories of designer's attitude are similar to the idea of human-centered design (Brown, 2008; Plattner et al., 2009). In this way, we consider designer has a dual nature of attitude, and depending on the innovation phase and type of innovation project, their attitude is flexibly stretched.

However, Norman & Verganti (2014) pointed out the most powerful pattern of design-led innovation is the combined case of HCD and DDI. We need to consider how extent their attitude in an each phase of innovation.

## 6. CONCLUSION

The present paper focused on the designer's attitudes towards problem-solving and exploratory research. Design is one of the most important topics in the field of innovation management. In the field of design management, much attention has been paid to the designer's thinking and important results have been obtained (Buchanan, 2004; Boland & Collopy, 2004; Kimbel 2013, Michlewski, 2015). This paper shown that; (1) through the expiring designer's attitude research, we extend six essences of designer's attitude toward problem-solving and exploratory research are revered (Figure 2). (2) The concept framework for the dual nature of designer's attitude toward design-led innovation (Figure 3).

Although our research revealed several essences of the designer's attitude and several formation factors of the essences, there are remaining problems that have scarcely been addressed. For example, what are the unique abilities of designers that are required for exploring activity? What is the best way to ensure that management does not inhibit the attitude of designers? What is the different point between designer's attitude and other professional's?

Additionally, our research needs to be conducted for different design occupations, such as design consultants and design managers. Furthermore, there is a need to investigate differences in attitude among other occupations such as marketers, engineers. In particular, it is necessary to understand the designer's thinking and attitude in contrast to the management's thinking and attitude, and to build better relationships between design and management. Through these researches, we should reveal more specific features of the designer to the innovation context.

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