

# PERCEIVED CREATIVITY AND DESIGN TEAM INTERACTION

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## ABSTRACT:

The present research was to explore about subjective perception on creativity in relation to personal creativity modes. In the second experiment, we compared creativity of conceptual design teams of two groups. Experimental design teams conducted a conceptual design task after teamwork practice activity immediately following self-awareness activity for personal creativity modes. The result shows that the teams in experimental group acquired higher score than those in control group without teamwork practice activity. Also we conducted detailed team interaction analysis of protocol data for a diverse team composed of various creativity modes and a uniform team composed of the same creativity mode. The analysis result of team interactions indicates that personal creativity modes could affect the way design teams interact.

**Key word: Perceived creativity, Team creativity, Design team Interaction**

## 1. INTRODUCTION

Creativity is an influential factor to change the world for enhancing the quality of human life in cultures, economics, technology, the arts, and beyond. There is a lot of creativity in everyday life as people try to solve problem at work and at home. Creativity is often defined as the development of original ideas that are useful.

The field of research on creativity began as the study of an individual cognitive and personality trait, has slowly expanded to include more dynamic and interconnected social systems such as work group (Kurtzberg and Amabile, 2001; Kurtzberg, 2005). As team interaction becomes an increasingly important part of creative organizational life with the information explosion and changing the social environment, it is critical to discover the underlying factors that lead team members to perceive themselves and their team as creative and to produce creative outcomes. Ideas begin at individual mind although these ideas will be shared and developed in a team (Kurtzberg, 2005). Thus, it is valid that research on team creativity should start at individual ideas and then explore the evolution of ideas as they develop in a team. Also, the exploration of interactions among individuals for team creativity can expand our understanding of both creativity and team interaction.

The goal of the present research is to explore about subjective perception on creativity in relation to personal creativity modes, and to analyze team interaction from the perspective of personal creativity modes. To assess personal creativity modes, Personal Creativity Mode Test (PCMT) (Wilde, 1999) was used. In addition, team activities promoting self-awareness of one's own creativity and idea generation for problem solving in diverse team were provided. Team interaction and the process of problem solving were analyzed by Interaction Process Analysis (IPA) (Besemer, 1998).

## 2. DIVERSITY AND TEAM CREATIVITY

With the information explosion and the social environment change, the development of innovation will increasingly require team interaction in the process of problem solving. Most organizations and much of the scientific processes now rely on the work of teams with diverse skills and knowledge (Paulus and Nijstad, 2003).

A team is a group of individuals who meet to perform some specific task. Teams learn together, share understanding of their work together. Diversity in a team can help the creative process by providing team with heterogeneous perspectives for consideration and by increasing the new ideas and creative production (Kurtzberg and Amabile, 2001; Kurtzberg, 2005).

Some studies of creative personality and other individual differences can give us critical insights in the examination of team-level creativity. The effectiveness of design creativity training program reflecting individual learner's characteristics to enhance design creativity was confirmed and team interaction patterns was different according to creative personality type (Kim, Kim and Kim, 2007). Also, the characteristics of design creativity identified in the process of problem solving were revealed (Kim, Kim, and Lee, 2006).

Diversity in a team can help the creative process by providing team with heterogeneous perspectives for consideration and by increasing the new ideas and creative production (Kurtzberg, 2005). Also, diversity affords positive effect on group decision performance (Hambrick, Cho, &Chen, 1996). However, diversity in a team does not always contribute to team process. Diversity or heterogeneity in the composition of a group may tend to have a negative effect on members' initial degree of satisfaction with their group. This is because the difference among members, to the extent that they are salient source of perceived difference, may cause members not to identify as strongly with the group as they might with a group of similar others (Miliken, and Martins, 1996; Nemeth and Nemeth-Brown, 2003). In spite of this explanation, we can not deny that there are many accounts of the success of collaboration (Bennis and Beiderman, 1997) and most people think team is better than individual.

### 3. STUDY I: EXPERIMENT ON PERCEIVED CREATIVITY

With the purpose of identifying relations between personal creativity characteristics and perceived creativity, 6 engineering students from Sungkyunkwan University participated in this experiment. The self-description on perceived personal characteristics and PCMT were analyzed.

#### 3. 1. PERSONAL CREATIVITY MODE TEST (PCMT)

According to the cognitive theory of Jung, there are four aspects in the personal cognitive preferences including perceiving/judging preference, factual/conceptual perception,

thinking/feeling judgment, and introverted/extroverted cognitive motivation. These four aspects can be deployed into eight different modes of creativity (Wilde, 1999), as shown in Table 1.

Table 1: Eight Personal Creativity Modes

	PERCEPTION		JUDGEMENT	
	Conceptual (Intuitive)	Factual (Sensing)	Objective (Thinking)	Subjective (Feeling)
Extroverted	Synthesizing	Experiential	Organizing	Teamwork
Introverted	Transforming	Knowledge-based	Analyzing	Evaluating

### 3. 2. RESULT: THE RELATION BETWEEN PCMT AND PERCEIVED CREATIVITY

We found correspondence between perceived personal creativity characteristics from self-description on one's own creativity and personal creativity mode identified through PCMT in Table 2. This finding demonstrated that self-perception on creativity is not diverged greatly from PCMT results and PCMT takes perceived validity through self-perception on creativity.

The personal creativity modes and self-description of six participants have been identified with the characteristics of each mode. Participants perceived one's own creativity in a corresponding manner with the creativity mode measured by PCMT. Following interpretation about self-description on one's own creativity relied on Levesque (2001) and Wilde and Labno (2001).

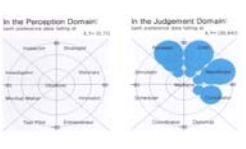


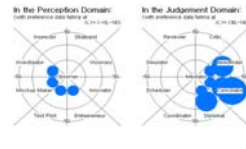
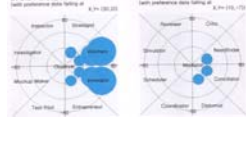
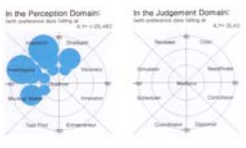
Based on that result, PCMT can have perceived validity by perceived self-description and it can be an effective test in identifying personal creativity mode, selecting and forming team. We confirmed the value of PCMT as a valid test in selecting and forming team considering personal creativity characteristics. In fact, it has been used at Stanford and Sunkyunkwan University in composing design teams so that the personal creativity modes are distributed as evenly as possible for all the teams.

### 4. STUDY II: EXPERIMENT ON TEAM INTERACTION

In order to analyze the effect of team activities to promote team creativity and to explore team interaction from the perspective of personal creativity modes, an experiment was conducted using

PCMT, and providing team activities promoting self-awareness of one's own creativity with self-description on perceived personal characteristics and stimulating idea generation for team interaction in the process of problem solving.

Table 2: PCMT Result and Self Descriptions

	PCMT Results	PCMT Result Diagrams	Self-descriptions
A	<b>Evaluating &amp; Analyzing Creativity</b>  Introverted, feeling		<ul style="list-style-type: none"> <li>▪ If something attracts me, I buy it without hesitation (<i>Ev</i>).</li> <li>▪ I am a kind of person who listens to other people when I do a groups assignment or task (<i>Ev</i>).</li> <li>▪ I buy something to be necessary on the spot rather than to previously prepare all the necessary items for traveling (<i>Ev</i>).</li> </ul>
B	<b>Knowledge-based, Analyzing, &amp; Evaluating Creativity</b>  Introverted, thinking, factual & feeling		<ul style="list-style-type: none"> <li>▪ I try to have know-how (<i>Kb</i>).</li> <li>▪ When I prepare for my travel, I only buy books and read them (<i>Kb</i>).</li> <li>▪ I feel impatient when I see other's idle behavior (<i>Ev</i>).</li> <li>▪ I only tend to summarize the essential points when I study for an exam (<i>Kb</i>).</li> </ul>
C	<b>Transforming &amp; Analyzing Creativity</b>  Introverted, conceptual & thinking		<ul style="list-style-type: none"> <li>▪ It is hard to define myself (<i>Tr</i>).</li> <li>▪ When I write reports, I just write anything that flashes into my mind without thinking first the whole contents. After that, I organize that sequence and finish the report (<i>Tr &amp; An</i>).</li> <li>▪ I assume a skeptical attitude toward a problem and I try to solve it by analyzing it (<i>An</i>).</li> </ul>
D	<b>Teamwork, Evaluating, &amp; Experiential Creativity</b>  Extroverted, feeling & factual		<ul style="list-style-type: none"> <li>▪ I do not like hanging around alone wherever I go (<i>Tw</i>).</li> <li>▪ I am only comfortable when I am satisfied with the feeling that I did my assignment perfectly (<i>Ev</i>).</li> <li>▪ When I go to the theater, I reserve the tickets if it is an important appointment. If not important, I just go to the theater and buy a ticket at the ticket box (<i>Ep</i>).</li> </ul>
E	<b>Synthesizing, Transforming, &amp; Teamwork Creativity</b>  Extroverted, conceptual & feeling		<ul style="list-style-type: none"> <li>▪ I regard figuring out information or surrounding as important (<i>Sn</i>).</li> <li>▪ I consider various experiences and thinking important (<i>Sn</i>).</li> <li>▪ I try to think over every possibility and be open to them (<i>Sn &amp; Tr</i>).</li> <li>▪ I am defiant and have lots of curiosity (<i>Sn</i>).</li> <li>▪ I like changes (<i>Sn</i>).</li> <li>▪ I put the priority on meanings (<i>Tr</i>).</li> </ul>
F	<b>Knowledge-based, Transforming, &amp; Experiential Creativity</b>  Introverted, factual & conceptual		<ul style="list-style-type: none"> <li>▪ I compare things carefully and get information in various ways when I shop (<i>Kb</i>).</li> <li>▪ When I write reports, I refer to the original material rather than my opinions (<i>Kb</i>).</li> <li>▪ When I buy a new product, I read first through an instruction (<i>Kb</i>).</li> <li>▪ I enjoy searching information more than playing games when using computers (<i>Kb</i>).</li> </ul>

*An*: Analyzing Creativity    *Sn*: Synthesizing Creativity    *Kb*: Knowledge-Based Creativity  
*Ev*: Evaluating Creativity    *Tr*: Transforming Creativity    *Tw*: Teamwork Creativity    *Ep*: Experiential Creativity

In first activity for self-awareness of creativity modes, students in experimental group were tied as a team sharing same mode. Next, 28 Design teams of about 6 students were composed using PCMT. In second activity for promoting teamwork, students in experimental group were retied as diverse teams and uniform teams according to the results of PCMT. 18 Teams in experimental group had an exercise of team interaction activity immediately following self-awareness activity for their creativity mode. 10 Teams in control group were not provided with the exercise. Finally, all teams in experimental group and control group were asked to perform a conceptual design task, 'Subway improvement' for 60 min. Team performances in conceptual design task were evaluated using 'novelty' and 'resolution' categories of Creative Product Semantic Scale (CPSS; Besemer, 1998). Student teams' conceptual design sessions were videotaped and we analyzed team interaction using 12 categories of Interaction Process Analysis (IPA; Bale, 1950)

#### 4. 1. INTERACTION PROCESS ANALYSIS (IPA )

We used Bales' IPA (1950) which was developed to measure communication behaviors in small groups. The IPA is appropriate for comparing interaction patterns between groups and each member in a group. It has been applied extensively to the study of small group interactions. There are twelve categories; positive social-emotional area (categories of 'shows solodarity', 'shows tension release', 'agrees'), negative social-emotional area (categories of 'disagrees', 'shows tension', 'shows antagonism'), and task area (categories of 'gives suggestion', 'gives opinion', gives orientation', 'ask for orientation', 'ask for opinion', 'ask for suggestion'). Task area is combined into two parts; giving answers or contributions to solving problem faced by the group, and asking questions in the task oriented areas.

#### 4. 2. CREATIVE PRODUCT SEMANTIC SCALE (CPSS)

CPSS developed by Besemer (1998) is an evaluation instrument designed to assess the creativity that is perceived to be manifested in products. CPSS was developed to help cultivate more careful observation of created products and to focus judges' attention on relevant attributes of products. 3 experts evaluated conceptual design task using category of novelty and resolution of CPSS. Novelty consists of originality and surprise; resolution is composed of logical, useful, valuable, and understandable.

### 4. 3. RESULT: THE EFFECT OF TEAM INTERACTION ACTIVITY

In order to verify hypothesis that the creative performance of design team task in experimental group will be higher in CPSS than that of control group, CPSS scores evaluated by three evaluators were used. Mean scores of experimental group were higher in all facets and categories of CPSS as well as total CPSS than those of control group as shown in Figure 1. Therefore, the team performance of experimental group provided with team interaction activity immediately following self-awareness activity was better than team performance of control group.

To analyze the effect of team interaction activity, we did t-test. Overall effect of team interaction activity was confirmed through t-test verifying team performance of conceptual design task ( $t=2.31$ ,  $df=26$   $p=.029$ ). To investigate specifically, surprising and original of novelty category had no difference between experimental and control group ( $t=1.64$ ,  $df=26$   $p=.113$ ). However, valuable, logical and useful and understandable of resolution category denoted the training effect of team interaction activity between experimental and control group ( $t=2.70$ ,  $df=26$   $p=.012$ ). This result implies that team interaction activity is more effective in improving practical and critical thinking ability to develop ideas valuable, logical, useful, and understandable ideas than in promoting originality and surprising.

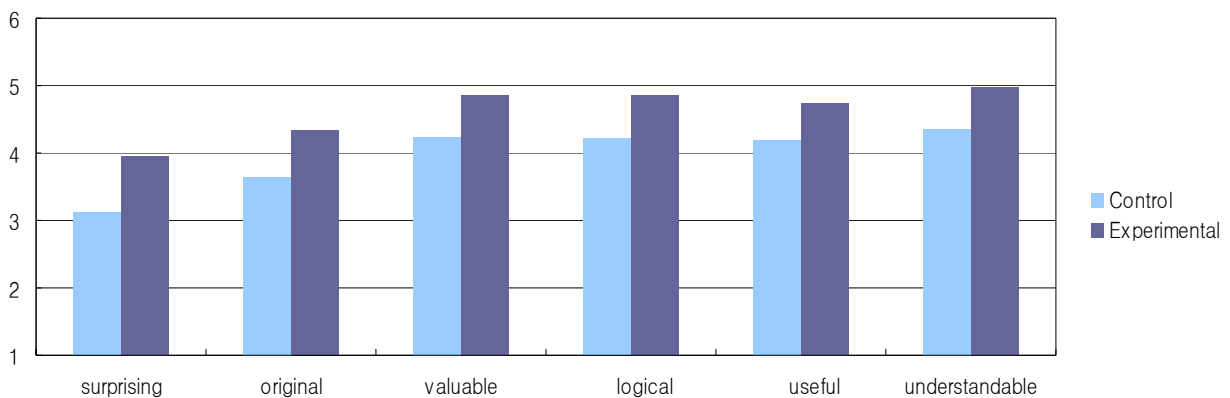


Figure 1: Mean for CPSS of Conceptual Design Task

### 4. 4. RESULT: TEAM INTERACTION

We conducted detailed team interaction analysis of two design teams composed with distinct characteristics using IPA. A diverse team was composed of students with all different primary

personal creativity modes. A uniform team was composed of students with the same personal creativity modes, evaluating and teamwork creativity mode.

Remarkable difference is shown between two teams in total counts of 'shows tension release', 'agrees', and 'gives suggestion' categories. In case of diverse team, it showed higher count than uniform team in 'agrees' and 'gives suggestion', in case of 'shows tension release', uniform team was shown higher. 'Gives opinion' category was most actively conducted in both teams. Even in case of uniform team that was composed of students who had introverted creative trait only showed not so much in 'agrees'. In case of 'shows tension release', uniform team showed more frequent occurrence per individual rather than in diverse team, showing comparatively even distribution. It is considered that the characteristic to support environment creating for smooth team activity of other members in the team since all members of uniform team have teamwork creativity. 'Disagrees' category was lower than 'agrees' one. There was no difference in the total counts of team interaction between two teams in totality; it was found that there was difference in detailed team interaction according to team organization by creativity mode.

## 5. CONCLUSIONS

With knowledge explosion and social environment change, it is critical for team members to perceive themselves and their team as creative and to understand strengths and weaknesses of their creativity. Most organizations and the process of problem solving rely on team interaction. The present study contributes to improving team creativity providing empirical evidence of the effect of team interaction activity in the process of problem solving. We could imagine that self-awareness of creativity modes led to understandings one's own and others' personal creativity characteristics and strength and weakness. Those understandings could help team interaction activity and contribute to the team synergy. Also, an explanation for how different team members interact according to personal creativity modes in order to solve team task could help understanding team creativity.

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