Doctoral Dissertation

Creativity and Innovative Performance

February 2018

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Abstract

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This study examined the effects of creativity-related characteristics of team members on innovative performance at the team level beyond the individual level. In a rapid environmental change, organizations have emphasized innovation as a key source of sustained growth and survival. Since creativity has been considered as a fundamental foundation of innovation, research on creativity has been increasing in management research field. Creativity research can be empirically divided into the individual level, team level, and organization level according to a unit of analysis. This study focused on the team-level creativity. Teams are widely used as core units in modern organizations. Nonetheless, team-level research on creativity was less conducted compared to individual level. Although the number of team-level studies has increased in recent years, it focused mainly on external variables or process variables. Environmental variables such as work environment
can influence creative outcomes, but the most fundamental element in determining team performance is individual team members. Process variables such as cohesiveness are also affected by the interaction of individual members. Therefore, it is necessary to examine the effect of the composition of team members’ characteristics on team-level performance.

The approach to creativity research can be broadly divided into focusing on individual differences such as personality traits and self-concepts, and focusing on cognitive processes such as cognitive styles and skills. This study consists of two studies using the above two approaches in order to comprehensively understand the team-level creativity. In the first study, I examined the influence of creative self-efficacy of team members on team performance from the perspective focusing on individual difference. Previous studies related to CSE have focused on positive aspects of CSE. Although CSE helps in reducing the productivity loss such as production blocking and evaluation apprehension that occurs in group discussion, it is also associated with negative effects such as escalation of commitment, self-productive attribution patterns, and lees seeking of information from critics. For this reason, I proposed the inverted-U shaped relation between aggregated CSE and innovative performance at the team level. And the hypothesis was statistically supported. In the second study, I investigated the effect of team members’ creative thinking ability on innovative performance at the team level in line with the approach focusing on cognitive processes. As a result of the statistical analysis,
the creative thinking ability of the individual members composed of divergent thinking and convergent thinking showed a positive correlation with the innovation performance at the team level.

**Keywords:** Organizational Creativity, Innovative Performance, Creative Self-efficacy, Team Composition, Diversity, Personality

**Student Number:** 2014-30163
# Table of Contents

CHAPTER I. INTRODUCTION .................................................................1

CHAPTER II. THE CURVILINEAR RELATION BETWEEN CREATIVE SELF-EFFICACY AND INNOVATIVE PERFORMANCE AT THE TEAM LEVEL: MODERATING EFFECTS OF PERSONALITY AND BACKGROUND DIVERSITY .................................................................7

1. INTRODUCTION ..............................................................................9
2. LITERATURE REVIEW .................................................................13
   2.1. Creativity in Organization ......................................................13
   2.2. Creative Self-Efficacy ..........................................................16
   2.3. Personality ...........................................................................20
   2.4. Diversity .............................................................................22
3. HYPOTHESES ............................................................................24
   3.1. Aggregated CSE and Innovative Performance at the team level 24
   3.2. Moderating Effect of Personality and Diversity at the Team Level .................................................................29
4. METHOD .....................................................................................34
   4.1. Research Setting ...................................................................34
   4.2. Aggregation Model ..............................................................35
   4.3. Measures .............................................................................37
5. RESULTS ....................................................................................41
6. DISCUSSION & CONCLUSION ......................................................43

CHAPTER III. CREATIVE THINKING ABILITY AND INNOVATIVE PERFORMANCE AT THE TEAM LEVEL: MODERATING EFFECTS OF PERSONALITY ........................................................................49

1. INTRODUCTION ............................................................................51
2. LITERATURE REVIEW .................................................................55
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1. CREATIVE THINKING ABILITY</td>
<td>55</td>
</tr>
<tr>
<td>2.2. PERSONALITY</td>
<td>57</td>
</tr>
<tr>
<td>3. HYPOTHESES</td>
<td>59</td>
</tr>
<tr>
<td>3.1. Creative Thinking Ability</td>
<td>59</td>
</tr>
<tr>
<td>3.2. Personality</td>
<td>64</td>
</tr>
<tr>
<td>4. METHOD</td>
<td>68</td>
</tr>
<tr>
<td>4.1. Research Setting</td>
<td>68</td>
</tr>
<tr>
<td>4.2. Aggregation Model</td>
<td>70</td>
</tr>
<tr>
<td>4.3. Measures</td>
<td>71</td>
</tr>
<tr>
<td>5. RESULTS</td>
<td>74</td>
</tr>
<tr>
<td>6. DISCUSSION &amp; CONCLUSION</td>
<td>78</td>
</tr>
<tr>
<td>CHAPTER IV. OVERALL CONCLUSION</td>
<td>87</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>93</td>
</tr>
<tr>
<td>국문초록</td>
<td>111</td>
</tr>
</tbody>
</table>
Tables

TABLE 1. Descriptive Statistics and Correlation Matrix………….48
TABLE 2. Results of Hierarchical Regression Analysis…………….49
TABLE 3. Descriptive Statistics and Correlation Matrix ………….86
TABLE 4. Results of Hierarchical Regression Analysis ……………87
TABLE 5. Results of Hierarchical Regression Analysis ………….88
TABLE 6. Results of Hierarchical Regression Analysis ………….89
CHAPTER 1. INTRODUCTION
What determines the innovative performance? This is one of the fundamental questions in the management field. Due to rapid changes in the environment and intensified competition, the duration of competitive advantage based on existing core competencies has gradually decreased. In this context, the importance of innovation is more emphasized. Researchers have been studying the leading factors of innovative performance from various perspectives. In recent years, as the creativity of employees have been emphasized as a critical source of innovation, studies on creativity are increasing in the field of business administration (e.g., Gong, Kim, & Lee, 2013; Hirst, Van Knippenberg, & Zhou, 2009; Jia, Shaw, Tsui, & Park, 2014). In particular, the field that focuses on variables that can affect organizational performance is called organizational creativity by distinguishing it from traditional creativity research. Organization creativity is defined as "the creation of a valuable, useful new product, service, idea, procedure, or process by individual working together a complex social system" (Woodman, Sawyer, & Griffin, 1993). Woodman et al. (1993) suggested that systematic research on the creative behavior of employees in a complex system such as firm can help the organizational science, because creativity may provide a key to understanding organizational change, effectiveness, eventually, survival.

Creativity research can be empirically divided into the individual level, team level, and organization level according to a unit of analysis. This study focused on
the team-level creativity. Teams are widely used as core units in modern organizations. In particular, teams such as TMT (top management team), R&D team, and design team that have a decisive impact on corporate performance often perform tasks that require creativity. Team-level research is therefore appropriate for investigating creativity related to innovative performance. Nonetheless, team-level research on creativity was less conducted compared to individual level. Creativity that has been traditionally studied in the field of psychology has largely been investigated at the individual level. Although the number of team-level studies has increased in recent years, it focuses mainly on external variables such as work environment or process variables. Environmental variables influence creative outcomes, but the most fundamental element in determining team performance is individual team members. Process variables such as cohesiveness are also affected by the interaction of individual members. Therefore, it is necessary to examine the effect of the composition of team members’ characteristics on team-level performance. For this reason, this study investigated how the characteristics of team members are linked to team-level performance beyond individual-level performance. In recent years, research has been conducted on how individual characteristics can be related to organization or team-level performance beyond individual level. For example, Oh, Kim, and Van Iddekinge (2015) conducted a study on the effect of personality traits of corporate HR managers on firm-level performance such as financial performance, firm labor
productivity. In this study, I examined the effects of the individual-level characteristics of team members on the team level performance in line with previous studies.

In this study, a laboratory research method is used for the above-mentioned research purpose. Previous studies on organizational creativity have mainly used field studies methods. Field studies have advantages in securing external validity, but they have difficulty in controlling various factors that affect creative outcomes. For example, external factors such as task characteristics, leadership styles of supervisors, and organizational culture influence creative performance. To overcome these limitations, laboratory research methods were designed. The laboratory research method used in this study is different from the prior research as follow. In previous research using laboratory study, the group for the study was typically composed of college students who were not acquainted with each other and the task was conducted for a relatively short period time. And the task, which is assigned to team members, is not meaningful for them. Therefore, there was a difficulty in examining the effects of interaction among team members. In contrast, participants were assigned a project to be performed during one semester in this study. In addition, these research designs are differentiated from the previous laboratory research in terms of motivation because the project outcomes are reflected in the final grade of the course.

The overall structure of this study is as follows. The approach to creativity
research can be broadly divided into focusing on individual differences such as personality traits, self-concepts, and focusing on cognitive processes such as cognitive styles and skills. This study consists of two studies using the above two approaches in order to comprehensively understand the team-level creativity. In the first study, I examined the influence of creative self-efficacy of team members on team performance from the perspective focusing on individual difference. In the second study, I measured the creative thinking ability of team members by divergent thinking and convergent thinking and investigated the effect of these characteristics on innovative performance at the team level in line with the approach focusing on cognitive processes.
CHAPTER II.

THE CURVILINEAR RELATION BETWEEN CREATIVE SELF-EFFICACY AND INNOVATIVE PERFORMANCE AT THE TEAM LEVEL: MODERATING EFFECTS OF PERSONALITY AND BACKGROUND DIVERSITY
1. INTRODUCTION

What determines the innovative performance of the firm? Rapid changes in technology and the environment have made this one of the most fundamental questions in the management field as well as academia. In the fast-changing environment, organizations have emphasized innovation as a key source of sustained growth and survival. (e.g., Amabile, 1988; Shalley, 1995). Employee’s creativity is regarded as a critical source of organizational innovation. (George, 2007; Zhang & Bartol, 2010). For this reason, research on creativity has been increasing in the field of business administration (e.g., Gong, Kim, & Lee, 2013; Hirst, Van Knippenberg, & Zhou, 2009; Jia, Shaw, Tsui, & Park, 2014). In particular, the field that focuses on variables that can affect organizational performance is called organizational creativity by distinguishing it from traditional creativity research. Organization creativity is defined as "the creation of a valuable, useful new product, service, idea, procedure, or process by individual working together a complex social system" (Woodman et al., 1993). Woodman et al. (1993) suggested that systematic research on the creative behavior of employees in a complex system such as firm can help the organizational science, because creativity may provide a key to understanding organizational change, effectiveness, eventually, survival.

In recent years, there has been an increase in research on creative self-efficacy in the field of organizational creativity research (e.g., Karwowski, 2016; Puente-
Díaz, 2016; Richter, Hirst, van Knippenberg, & Baer, 2012; Tierney & Farmer, 2011). Creative self-efficacy (CSE), the belief that one has the knowledge and skills to produce creative outcomes, is an emerging theme in organizational creativity studies (Tierney & Farmer, 2002). CSE is considered as a key driver of individual creativity (Richter et al., 2012). In the previous research, creative thinking ability and creative personality have been focused on examining the antecedents of creative performance and innovation performance. However, in order to achieve creative performance, creative potential must first be manifested and expressed. In other words, creative action or expression must precede. Even if someone has creative competence and expertise, performance will not be realized without a willingness to do it. Creative self-efficacy means self-belief that someone can perform a given task creatively. From this point of view, creative self-efficacy can influence the motivation of creative expression. Individuals move into action when they are confident that they can achieve the desired outcome. Many researchers have emphasized an intrinsic motivation for creative performance (Barron & Harrington, 1981; Woodman et al., 1993). In this respect, research on creative self-efficacy is increasing.

Previous studies on CSE have the following limitations. First, most studies have focused on positive aspects of CSE at the individual level. Organizational creativity research is ultimately concerned with the relationship between creativity and performance of the organization. Organizational creativity research can be
conducted at the individual level, team or group level, and organization level, depending on the level of analysis. Each of these studies is meaningful because creativity at each level influences organizational performance through interaction (Woodman et al., 1993). Nonetheless, CSE research to date has been mainly done at the individual level (e.g., Jaiswal & Dhar, 2015; Tierney & Farmer, 2002; Tierney & Farmer, 2011), except a few cross-level research (e.g., Richter et al., 2012). Team-level research on CSE is important because the core business unit in a modern organization is a team. Team-level research results, where the interaction between team member affects team performances, may show a different pattern from the individual level. Previous studies have mainly focused on the positive effects of CSE. However, according to previous studies on the negative impact of general self-efficacy, such as escalation of commitment (Staw, 1997), self-protective attribution pattern (Silver, Mitchell, & Gist, 1995) and less seeking information, CSE may hurt the team’s performance. As a member of the social context, individuals are influenced by the characteristics of other members. Therefore, the negative effects of CSE will be more evident at the team level, in conjunction with the characteristics of team creativity. In this study, I analyze the relationship between team member’s CSE and innovative performance at the team level.

Second, there is a lack of research on boundary conditions that affect the relationship between CSE and performance. I selected two elements of team
composition. First, I proposed team members’ dispositional characteristics which are considered as a deep-level variable (Somech & Drach-Zahavy, 2011). Second, I suggested team educational diversity which is regarded as a surface-level variable (Somech & Drach-Zahavy, 2011). Organizations use teams because team members’ diverse perspectives, knowledge, and experience stimulate each other's thinking and generate synergies. However, this exchange of ideas is not automatic. It is important to know the conditions of active interaction. Because personality traits affect individual thoughts and behaviors, they can have a direct impact on team interaction. In this study, we analyzed the moderating effect of agreeableness, which is closely related to interaction, on the relationship between CSE and performance. In addition, I analyzed the moderating effects of the major diversity of team members on the relationship between CSE and innovation performance, because various views, skill, and knowledge of team members are important for creativity.

For this purpose, I use laboratory study method. So far, most of the organizational creativity studies have used the field study in which creative or innovative performance was measured using the subjective evaluation by the supervisor. Although field studies have advantages in terms of securing externality validity, it is not able to control a variety of external variables such as task characteristics or leadership styles that can affect creative outcomes. There is also a problem that evaluation criteria are different between people who measure
performance. Some previous studies have used laboratory research methods, but these studies have had the following limitations. The group for the study was composed of college students who were not familiar with each other and the task was performed for a relatively short period time. And the team members were assigned tasks that were not meaningful for them. Therefore, there was a difficulty in examining the effects of interaction among team members. On the other hand, teams in the actual organization have a common specific purpose, and the team members interact with each other for a considerable time. For this reason, there was a limit to applying a laboratory study to actual business field. In this study, participants were assigned a project to be performed during one semester. In addition, these research designs are differentiated from the previous laboratory research in terms of motivation because the project outcomes are reflected in the final grade at the end of the semester. Review studies on laboratory studies and field studies in social psychology have concluded that the phenomena of laboratory research are similar in the field (Mullen, Driskell, & Salas, 1998).

2. LITERATURE REVIEW

2.1. Creativity in Organization

Following previous studies, I define creativity as “the production of novel and useful ideas concerning products, services, processes, and procedures by an employee” (Zhou & Shalley, 2003). Creativity has traditionally been a subject of
research in the psychology field. However, as the importance of creativity in society is emphasized, it is now being used as a major research topic in a wide range of disciplines such as education, sociology, engineering, and business administration. In particular, the field of creativity research related to management or organizational research is called organizational creativity by distinguishing it from traditional creativity research. Organizational creativity is a relatively new and emerging field of research, distinguished from traditional creativity research in that it exclusively focuses on variables that can directly implicate the organization or workplace (Zhou & Shalley, 2007). Woodman et al. (1993) defined organizational creativity as "the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system". Research on organizational creativity in management is increasing because creativity is emphasized as the foundation of innovation. Until now, innovation has been studied mainly in economics, engineering and management, while creativity has been mainly studied in psychology (Ford, 1996). There are two ways of distinguishing the conceptual difference between creativity and innovation. First, creativity and innovation are fundamentally the same phenomena, but they are different in that they occur in different units of analysis. Creativity is a phenomenon at the individual or group level, and innovation is the phenomenon at the organizational or enterprise level. (Ford, 1996) suggested that these claims limit the role of creativity in the field of innovation research.
Innovation researchers have overlooked the importance of research on creativity at the individual and group level. Second, creativity is an important factor in the creation of alternatives at an early stage in the process of innovation. Damanpour (1991) argued that the main focus of innovation researchers has been on the adoption or diffusion process of technology or innovation. For this reason, he pointed out that factors, which can contribute to the creation of new ideas, products, and services, have been overlooked in innovation research. Ford (1996) suggest a more productive stance that overcomes the limitations of existing perspectives on the relationship between creativity and innovation is "to consider the role of creativity play across levels of analysis and throughout different phases of the innovation ".

Woodman et al. (1993) recognized innovation and creativity as a subset of relationships. Innovation comes from new products, services, ideas or processes created through creativity, but it also comes from the adaptation of ideas created outside existing products or services or organizations. To summarize the various discussions on the relationship between creativity and innovation, while creativity emphasizes the process of generating new idea, services, and products, innovation focuses on the application and implementation of created ideas (Oldham & Cummings, 1996).

Organizational creativity research can be divided into individual, team, and organizational studies according to the level of analysis. Although the creativity
of each employee is fundamental to the organizational creativity, an employee is bound to be influenced by the team to which the individual belongs, as well as the organization to which the team belongs. Woodman et al. (1993) proposed an interactionist perspective on creativity by borrowing a viewpoint of interactional psychology to understand integrational creativity. Traditionally, the focus of creativity research has remained largely at the individual level. Organizational creativity research has also been conducted at the individual level due to difficulties at the team level research. However, as the use of team unit in organizations increases, the need for team-level creativity research is also increasing. Amabile (1983) pointed out the problems of existing research focusing on personality and cognitive ability and emphasized the importance of social influence and environmental influence as factors affecting creative performance. In particular, in the case of organizational creativity, the members of the organization operate within a unit of a complex social system such as a company or a team. Therefore, creativity research is increasing at the team level in recent years because it can show different aspect of creativity at the individual level.

2.2. Creative Self-Efficacy

Creative Self-Efficacy (CSE) refers individuals’ own belief that they can perform their tasks creatively (Tierney & Farmer, 2002). CSE, which is the emerging research theme (e.g., Tierney & Farmer, 2002, 2011; Gong, Huang, & Farh, 2009; Lim & Choi, 2009), is a significant driver of individual creativity
(Richter et al., 2012). In the previous research on the relationship between creativity and performance, individual creative thinking capability or creative personality has been mainly focused. However, creative achievement can only occur when the creative potential is expressed. Even if employees have a lot of creative potentials, it is useless if they do not have the will to do it. CSE means a belief in one's ability to creatively perform a task or role given to him or her. CSE can influence their motivation to express their creative potential because people are motivated when they are expected to achieve their desired performance. Understanding the conditions of creative performance is the fundamental goal of organizational creativity research. In order to achieve this goal, research on CSE is increasing (Jaussi, Randel, & Dionne, 2007; Shalley, Zhou, & Oldham, 2004).

Tierney and Farmer (2002) proposed a creativity-specific self-efficacy construct by linking the self-efficacy literature with the creativity literature. Self-efficacy is a concept originally proposed by Bandura (1977), which means confidence in the ability to achieve the intended performance. (Amabile, 1988) argues that there is a difference between performing a given task well and creatively performing it. Likewise, the belief that someone can perform a specific task is not necessarily the same as the belief that someone can perform a given task creatively (Tierney & Farmer, 2002). Bandura (1997), who presented the concept of self-efficacy, also suggested that different efficacy types could be expected to better explain specific outcomes. Specific self-efficacy, such as
computer self-efficacy (Gist, Schwoerer, & Rosen, 1989), self-efficacy for the job of entry-level accountant (Saks, 1995) and job seeking self-efficacy (Caplan, Vinokur, Price, & Van Ryn, 1989), have been suggested. The fact that specific measures are more accurate than general self-efficacy was been demonstrated by some researchers (Locke & Latham, 1990). In other words, creative self-efficacy may be more effective than general self-efficacy in predicting creative performance and innovation performance. Tierney and Farmer (2002) proposed a construct of CSE and verified the discriminant validity and criterion validity of CSE and general self-efficacy through an empirical analysis.

Previous research on CSE can be broadly divided into studies that identify leading factors influencing CSE and studies that examine the outcomes of CSE. First, the factors affecting the CSE can be divided into the characteristics inherent to the individual and environmental factors. As a personal traits, job tenure, education level, and job self-efficacy (Tierney & Farmer, 2002), learning orientation (Gong et al., 2009), creative role identity (Tierney & Farmer, 2011; Wang, Tsai, & Tsai, 2014), curiosity (Karwowski, 2012) are suggested. As an environmental factor, supervisor support, job complexity (Tierney & Farmer, 2002), transformational leadership (Ghafoor, 2011; Ghafoor, Qureshi, Azeemi, & Hijazi, 2011; Gong et al., 2009; Mittal & Dhar, 2015; Wang et al., 2014), job creativity requirement, and supervisor creativity expectation (Tierney & Farmer, 2011) have been investigated. Amabile (1983) proposed a componential
framework which suggested domain-relevant skills, creativity-relevant skills and task motivation as components for creative performance. CSE researchers argued that CSE have an impact on motivation, which ultimately has a positive impact on creative performance and innovation performance. Creative performance is influenced not only by the creative thinking capabilities of individuals but also by their will or motivation. Bandura (1997) emphasized that strong self-efficacy is required for creativity. Ford (1996) also suggested self-efficacy as a critical motivator in a model of individual creative behaviors. In this respect, CSE has been studied as an antecedent that positively influences creative performance and innovation performance (e.g., Gong et al., 2009; Tierney & Farmer, 2002; Tierney & Farmer, 2011) and innovative behavior or risk-taking (e.g., Michael, Hou, & Fan, 2011).

However, the previous research has mainly focused on the positive aspects of CSE at the individual level. Excessive self-efficacy, however, can have a negative impact on performance. In particular, the negative impact of excessive CSE may be more pronounced within the team. In modern workplaces, teams are being used as important units. However, few studies have analyzed the impact of CSE on team performance at the team level. In order to supplement the fragmented understanding, I develop analyzed the effect of aggregated team members’ CSE on team performance. In addition, I investigated boundary conditions that moderate the relationship between aggregated CSE and team performance. First, personality
variable is suggested as a factor that can counteract negative aspects of CSE. Next, the diversity of the members is presented as a moderating variable to strengthen the relationship between CSE and team performance.

2.3. Personality

Personality is “a set of individual differences that are affected by the development of an individual: values, attitudes, personal memories, social relationships, habits, and skills” (Mischel, Shoda, Smith, & Mischel, 2004). The personality of an individual is a subject that is studied extensively in the field of social sciences including psychology and business administration in that it affects how people think, feel and act (Costa & McCrae, 1992). Personality variables are mainly studied at the individual level. However, recently there is a growing body of research on how members’ personal knowledge, skills, abilities, as well as other differences such as personality traits affect teams or organizations beyond individual performance (e.g., Oh et al., 2015; Ployhart, Van Iddekinge, & MacKenzie, 2011; Ployhart, Weekley, & Ramsey, 2009). Human capital resource research suggests that the aggregated individual difference affect the performance of higher level unit through the emergence of human capital resources (Ployhart, Nyberg, Reilly, & Maltarich, 2014; Van Iddekinge et al., 2009). Personality is one of the important microfoundations of human capital resources (Oh et al., 2015; Ployhart, 2012). In terms of the resource-based theory of the firm, the personality traits of the members are heterogeneous for each company, and these
heterogeneities can be management resources that can affect the performance of the company.

Organizational creativity assumes interactions within a complex social system (Woodman et al., 1993). Creative achievement is influenced by social and environmental factors (Amabile, 1983). Since Amabile (1983) emphasized the importance of social and environmental factors, research on climate, which positively affects creativity, and process variables has increased (e.g., Hülsheger, Anderson, & Salgado, 2009). These studies were conducted by surveying individual members of the team or supervisors to measure process variables. However, it is meaningful to investigate the direct relationship between the team members’ personality and performance, because individual members’ personality is the most basic components affecting the interactions and processes among the team members. The input-process-output model is a representative model that describes the mechanism for team-performance relationships (Barrick, Stewart, Neubert, & Mount, 1998). This model suggests that the various inputs are gathered to influence the processes in the group, which in turn affect the performance (output) of the team. Personality is a representative factor of individual level, and it is a factor that has a decisive influence on interactions among team members.

The five-factor model (FFM) is a representative framework for characterizing personality (Goldberg, 1993). FFM describes the personality using five factors: extraversion, agreeableness, conscientiousness, emotional stability and openness
to experience. Personality theory assumes that these five factors are relatively stable over a lifetime and that each factor causes humans to behave in a particular way (McCrae & Costa Jr, 1997; Robertson & Callinan, 1998). The FFM has been used as a comprehensive and robust framework for research on personality (Mount, Barrick, & Stewart, 1998).

Personality and self-efficacy such as self-concept variables have been examined in different theoretical traditions (Karwowski, Lebuda, Wisniewska, & Gralewski, 2013). While personality was considered as "hard core" variables originating from the biological characteristics, self-concept variables were regarded as "surface characteristics" that could change more easily and could be affected by life events and circumstances (Asendorpf & Van Aken, 2003). While some researchers have argued that personality and self-concept interact with each other (Marsh & O'Mara, 2008) or others have predicted that personality influences self-concept (Asendorpf & Van Aken, 2003), A meta-analysis of the relationship between employee personality and general self-efficacy in the work context revealed that moderate correlation was observed among some of the big five (Judge, Jackson, Shaw, Scott, & Rich, 2007).

2.4. Diversity

Diversity is typically conceptualized as referring to “differences between individuals on any attribute that may lead to the perception that another person is different from self” (van Knippenberg & Schippers, 2007). The criteria for group
diversity are typically observable demographic attributes. These variables can be further subdivided into less job related (e.g., gender, age, ethnicity) and higher relative job relevance (e.g., educational, functional background) (Jackson, 1992; Jehn, Northcraft, & Neale, 1999). There are other non-observable characteristics such as differences in personality, attitudes, and value (Bowers, Pharmer, & Salas, 2000; Harrison, Price, & Bell, 1998). Diversity has been studied extensively in terms of its impact on the work processes and performance of the group. Diversity research is divided into two main streams: the social categorization perspective and the information/decision-making perspective (van Knippenberg & Schippers, 2007; Williams & O'Reilly, 1998). The social categorization perspective argues that similarities and differences among members within a group form a subgroup within the group. People have a tendency to trust and cooperate more with ingroup member which have similar characteristics (Brewer, 1979). In this respect, the perspective suggested that the smaller the diversity among group members, the more smooth and efficient the work is. On the other hand, the information/decision-making perspective focuses on the positive aspects of group membership diversity. The perspective argued that the various group members are more likely to have a broader knowledge, skills, competencies, and perspectives related to their jobs, which can help them perform effectively non-routine tasks. In general, whereas task-related surface-level attributes (e.g., educational diversity, functional diversity) is considered to be more related to the information/decision-
making perspective, relation-oriented diversity such as gender, ethnicity regarded to be related to the social categorization perspective (Jackson, 1992)

Research on the relationship between creativity and diversity is mainly focused on the positive side. Diversity seems to encourage group creativity. A different perspective, a new solution to an old problem, a combination of previously unrelated processes, products, and ideas are required for creativity (Mumford & Gustafson, 1988). The team can provide the knowledge and information needed to stimulate new ideas and create new combinations (Baer, 2010; Mumford & Gustafson, 1988; Richter et al., 2012). For this reason, the use of team organization is increasing in modern organizations, and the diversity of members is also increasing (Jackson, Joshi, & Erhardt, 2003; Williams & O'Reilly, 1998)

3. HYPOTHESES

3.1. Aggregated CSE and Innovative Performance at the team level

Modern organizations organize groups to perform creative tasks because the group's performance is greater than the simple sum of the individual's performance. Each group member with different knowledge, viewpoints, and beliefs stimulate other members to think of ideas that can not be thought of when they are alone. Human beings can not recall their own all knowledge and experience when they need. Certain knowledge or memories are easier to come up with than others, and
Some knowledge and memories are not readily accessible. At this time, new stimuli through interaction with other people can help to recall their knowledge, experience, and thoughts that have not been reminiscent of the past. In other words, the beginning of organizational creativity is the exchange of ideas of individuals. Even if employees have creative potential and have great ideas, it is meaningless without expressing it. The creative performance at the team level is greatly influenced by open communication among members (Goncalo, Flynn, & Kim, 2010; Nijstad, Stroebe, & Lodewijkx, 2002). Nonetheless, individuals belonging to the team may not be able to achieve the maximum contributions by not 1) making efforts to find creative alternatives, or 2) not expressing their ideas even if they think of good ideas.

Ford (1996) argues that in the model of individual creative action, an employee must choose between two competing options that either work creatively or follow existing routines. Bandura (1986, 1997) argued that an individual is motivated when someone has the ability to perform a specific task and expects to achieve the desired outcome in social cognitive theory. That is, when there is a belief that a task can be accomplished successfully, the behavior is triggered. For this reason, Bandura (1997) suggested that strong self-efficacy is an important to achieve creative outcome. Diehl and Stroebe (1987) suggested 1) production blocking, 2) evaluation apprehension, 3) free riding as factors that cause a loss of productivity in group discussion. Production blocking means that a group member
is listening to the ideas of other members and waiting for someone else to express their ideas until they are finished (Nijstad et al., 2002). Production blocking is considered as the biggest inhibitor of in group discussions (Diehl & Stroebe, 1987). Production blocking issues do not appear only when the discussion time is short. Even if the discussion time is long, it can happen if 1) participants forgot their idea after waiting for their own time, or 2) they give up expressing their opinion because they think that their idea is not appropriate as the discussion progresses.

Being unable to concentrate on one's thoughts while listening to someone's ideas can also be a factor of loss. Goncalo et al. (2010) suggested that narcissistic individual reduces production blocking by interrupting others' stories and telling them their stories and, in turn, enhances creative performance. With this logic, a high CSE can help reduce production blocking and generate more ideas. CSE can also help group performance in terms of evaluation apprehension. Evaluation apprehension means that someone does not actively express their opinion because of the concern about the negative evaluation of the idea they presented. High CSE can help improve performance by actively participating in group interaction by reducing concerns about negative evaluations. Active participation in group interaction is helpful in the evaluation phase as well as in the creation of ideas. When a group evaluates several alternatives together, they can think about feasibility and potential for success from different perspectives. This allows for better outcomes by increasing the likelihood of excluding inappropriate
alternatives (Larey & Paulus, 1999). CSE can have a positive impact on team performance by reducing free riding during group discussions. Free riding or social loafing refers to the phenomenon in which people do not do his or her best efforts to achieve a common goal in a group activity. The first reason of social loafing is difficult to identify individual contribution properly in a group activity. The second reason is the negative perception of the effectiveness of his contribution. In other words, people do not participate in team activities because they think that they will not affect team performance even if they make efforts. High CSE may have a positive impact on the perceived effectiveness of individual contribution.

Yet, the relation between CSE and creativity at the team level may be more complicated than a simple linear association. When an individual performs a task in a group, coordination costs arise in the interaction process (Hackman & Morris, 1975). Excessive CSE can reduce group performance by increasing this coordination cost. For example, while CSE help to exchange ideas more effectively by reducing the so-called production blocking (Diehl & Stroebe, 1987), the overly high CSE can be an obstacle to derive one final idea by coordinating each other’s ideas within a given time (Jehn & Mannix, 2001). In other words, CSE is helpful in that it generates more output in the idea or alternative creation stage, however, it can have a negative impact on the selection of the best alternative among the various alternatives.
Previous research on the relationship between general self-efficacy and escalation of commitment can also identify the negative impact of CSE on team performance. Escalation of commitment means a pattern of behavior that increases the effort rather than changing the choice, even though the individual or group has faced negative consequences for any decision, action, or investment. Staw (1981) pointed to past-oriented rationality as the cause of escalation of commitment. Human beings have a nature that they want to show off their rationality not only in the future but also in the past. The confidence that people can deal with uncertain and negative circumstances leads to the escalation of commitment. Whyte, Saks, and Hook (1997) argued that escalation of commitment appeared more frequently and stronger when people perceived their self-efficacy higher. At the individual level, persistence may have a positive effect on enhancing creative performance. At the team level, accepting the views and ideas of the other team members can be more effective for improving innovative performance rather than each individual member constantly sticking to his or her original ideas and continuing to them. Excessive CSE can have a negative impact on team performance.

In attribution theory, Silver et al. (1995) suggested that self-protective attribution patterns have a relation with self-efficacy. People who perceive their self-efficacy highly tend to make self-serving attribution (e.g., bad luck) when they faced with an unsuccessful performance. Creative process is very iterative because
there is little chance of success with the initial great idea. For better performance, especially in the team, it is important to share ideas, accept opinions from others. Attributing the issue of one’s ideas outside does not help with performance. In order to make better performance in a given constraint, it is necessary to acknowledge problems and insufficient parts of his or her initial idea. Audia, Locke, and Smith (2000) demonstrated that past success experiences cause higher level of self-efficacy, and consequently this lead to less seeking of information from critics. Because the synergy of the team for creative achievement comes from the exchange of various opinions, attitude to stick to one’s own opinion without listening to others’ idea can have a negative impact on performance. Given these trade-offs, I propose an inverted U-shaped relationship between aggregated CSE and innovative performance at the team level. Based on the above discussion, we set the following hypothesis.

Hypothesis 1. There will be an inverted U-shaped relation between aggregated CSE and innovative performance at the team level.

3.2. Moderating Effect of Personality and Diversity at the Team Level

Although team performance is influenced by a variety of factors, research and practices demonstrated that the right composition of individual in a team is the most elemental factor for team effectiveness (Mathieu, Maynard, Rapp, &
Gilson, 2008). Harrison et al. (1998) suggested that the quality and contents of the interaction between team members are affected by the composition of the team members’ characteristics. Composition variables can be divided into deep-level which mean psychological traits such as personality and values and surface-level which refer to readily observable variables such as demographic characteristics. In this study, agreeableness was suggested as a moderating variable that could influence the quality of team interaction. And I examined the moderating effect of major diversity as a factor affecting the content of interaction among team members.

### 3.2.1. Moderating Role of Educational Diversity

The source of the synergy of team creativity is various perspectives, knowledge, experiences of team members. Creativity needs a different perspective, a new solution to an old problem, a combination of previously unrelated processes, products, and ideas (Mumford & Gustafson, 1988). Thus, team with high diversity related to tasks indicates that the team has more resources needed for creativity. Creativity is fostered by heterogeneity because team with more heterogeneity in major and function may have a broader range of information and view in value-in-diversity thesis (Bantel & Jackson, 1989). Information and decision-making theorists also relate diversity into better cognitive processing and improved use of information (Watson, Kumar, & Michaelsen, 1993).

Education and work experience are the most typical ways to acquire
knowledge (Tierney & Farmer, 2002). Individuals are exposed to different perspectives, knowledge bases and problem-solving skills according to their major in education period. Work experience also gives an opportunity to learn about them. Williams and O'Reilly (1998) pointed educational diversity as the most relevant factor for creativity because people learn different knowledge, skill and problem-solving skills from formal education. Bell, Villado, Lukasik, Belau, and Briggs (2011) demonstrated that functional and educational background diversity have a positive relationship with general team performance as well as with team creativity and innovation. In particular, the relationship is much stronger for ambiguous or open-ended tasks such as design, product development team, and top management team.

Diversity also helps in the process of evaluating diverse ideas. When a group evaluates several alternatives, they think about the feasibility from different perspectives. This increases the likelihood of excluding inappropriate alternatives (Larey & Paulus, 1999). Assessing the feasibility of ideas is particularly important for organizational creativity, which is deeply related to innovation. In addition, members with diverse majors can contribute to the creativity of the team in that they can be a contact point for communication with various external groups. Communicating with diverse outside groups with different backgrounds can have a positive impact on creative outcomes because they can deliver a completely new approach to the problem at hand (Perry-Smith & Shalley, 2003). For these reasons,
I proposed the following hypothesis.

**H2. Major diversity will moderate the inverted U-shaped relation between aggregated CSE and innovative performance at the team level such that team with high major diversity will exhibit higher innovative performance than those with low major diversity.**

**3.2.2. Moderating Role of Agreeableness**

The Five-Factor model distinguishes the personality by five-factor: extraversion, agreeableness, conscientiousness, emotional stability and openness to experience. Among these, extraversion and agreeableness are the factors that directly affect interaction with others. Agreeableness, which refers to a tendency to be cooperative, helpful and compassionate towards others, is related to team interaction. Barrick et al. (1998) demonstrated high agreeableness affect team effectiveness positively. Characteristics such as helpful, trusted, friendly, tolerant (Costa & McCrae, 1992) and non-competitive (Graziano, Hair, & Finch, 1997) possessed by team members with high agreeableness can make a favorable effect on team process. Graziano et al. (1997) demonstrated that agreeableness is related to more positive perception from the opposing idea. Jackson, Stone, and Alvarez (1992) suggested that people who have high level of agreeableness have the ability to effectively mediate opposing ideas. These characteristics will reduce the
negative effects of the CSE mentioned above and improve overall team performance.

In resource-based view, various perspectives that team members have can be a resource that benefits the team creativity (Jackson, 1992). Synergy for team creativity occurs when knowledge, viewpoints, and experience of team members stimulate each other’s thoughts. In other words, it is necessary to share and integrate the ideas and viewpoints of each other. In addition, it is important to integrate various ideas without conflict. Team performance is always influenced by coordination cost or motivational loss in group interaction. In particular, as mentioned earlier, CSE can increase these negative costs because team member with high CSE tends to ignore others’ opinion and stick to their own ideas. To realize the benefits of the team, effective coordination and integration of several ideas are very important. Agreeableness may diminish the negative effects of excessive CSE on team interaction while keeping the benefits of CSE. The very essence of team effectiveness and agreeableness is cooperation. The attributes associated with high agreeableness can help team members collaborate. This can ultimately benefit the team’s performance. A team composed of members with high agreeableness can choose a better alternative. Based on the above argument, I develop the following hypothesis.
H3. Aggregated agreeableness will moderate the inverted U-shaped relation between aggregated CSE and innovative performance at the team level such that team which scores high on agreeableness will exhibit higher innovative performance than those which score low on agreeableness.

4. METHOD

4.1. Research Setting

In order to test the hypothesis of this study, laboratory research method was used. 200 undergraduate and 223 MBA students participated in this study. The average age of participants was 31.39 years (s.d.=9.14). Participants were randomly assigned to the team and were asked to complete the project for one semester. Project term was from 3- to 12- week depending on the course. Finally, the total number of teams included in the study is 101. The outcomes of the project were reflected in the final grade. All teams performed the same project to generate creative business ideas during the semester. During the project, each team constantly develops ideas through active interaction among the members. At the end of the semester, each team has to present their final ideas.

The laboratory research method used in this study is different from the prior research as follow. In previous research using laboratory study, the group for the study was generally composed of college students who were not acquainted with each other and the task was conducted for a relatively short period time. And the
task, which is assigned to team members, is not meaningful for them. Therefore, there was a difficulty in examining the effects of interaction among team members. In contrast, participants were assigned a project to be performed during one semester in this study. In addition, these research designs are differentiated from the previous laboratory research in terms of motivation because the project outcomes are reflected in the final grade at the end of the semester.

For evaluating innovative performance of the team, product based assessment was used. Amabile (1983) argued that product-based operationalization is appropriate for two reasons. First, process-based operationalization is not feasible because of research design and the current state of psychological theory. Second, and more importantly, product based assessment is reasonable since final product shows the total sum of creativity and interaction of the members. In this study, product, new business idea, was assessed by the professor of course at the end of each semester. Because creativity is regarded to be historically, culturally and socially bound (Amabile et al., 1996), previous research suggests that assessment from appropriate judges is important (Zhou & Shalley, 2003). Professor with specialized domain-specific knowledge could be an appropriate assessor. Given domain-specific knowledge and a non-supervisor/employee relationship, experts are more objective. The final score ranged from 1 to 10.

4.2. Aggregation Model

The unit of analysis in the present study was the team. In this study, all
hypotheses were presented at the team level, and the variables used in the analysis were calculated by converting the variables assessed at the individual level to the team level. (Rousseau, 1985). In the multilevel theory, an aggregation model that translates variables measured at a lower level into higher-level variables can be broadly divided into a team profile model and a relative contribution model (Mathieu, Tannenbaum, Donsbach, & Alliger, 2014). Appropriate aggregation methods should be chosen to take into account the characteristics of the task and the nature of the variables being aggregated. In the case of team profile model, team level variables are calculated by utilizing descriptive statistics of member characteristics (e.g., mean values or some diversity indices). All the characteristics of the individual members are equally treated. Team profile model assumed that the influences of team members are equal. On the other hand, the relative contribution model suggested that the performance of the team is more influenced by some of the team members. Some members may have a greater influence on team performance, due to their position or role. Appropriate aggregation methods should be judged by considering the characteristics of the task to be performed and how the phenomenon of the lower level is expressed at the higher level (Kozlowski & Klein, 2000). Given the research setting in which participants were randomly organized and no one was selected as a leader, it is appropriate to assume that all participants have equal power.
4.3. Measures

4.3.1. Independent Variable and Moderators

CSE To assess the participants’ creative self-efficacy, I used Tierney and Farmer (2002)’s three-item scale. Tierney and Farmer (2002) developed an initial questionnaire based on self-efficacy (e.g., Bandura, 1997) and creativity literature (e.g., Amabile, 1988; Woodman et al., 1993). The items were written in general fashion according to Amabile's view related to general creative skill. The questionnaire is then reduced through initial test. After exploratory factor analysis, the final three questions were completed. The reliability of the assessment tool was not further improved by adding the item (Tierney & Farmer, 2002).

The participants were asked to assess their belief in terms of their ability to perform creative behavior successfully (1, “strongly disagree”; 7, “very strongly agree”). Sample items include “I have confidence in my ability to solve problems creatively” and “I feel that I am good at generating novel ideas”. CSE score of each team member was averaged and converted to a team level construct. Considering that CSE affects the motivation of the creativity of the members of the team and leads to active participation, it is appropriate to regard CSE as the sum of CSE of the members. The higher CSE, the more likely the members will be engaged more creatively. Averaging team member characteristics are the most common operationalization method for calculating team-level variables in a multi-level model (see Pirola-Merlo & Mann, 2004; Taggar, 2002). To sum, although
CSE is an individual trait, conceptually it is reasonable to convert them to the team-level variable by using appropriate aggregation method.

**Major Diversity** This construct captures categorical differences in major of team members. Like previous diversity literature, Blau (1977)’s index of heterogeneity was used to captures categorical differences in the educational background of team members. In this study, the majors were divided into 9 categories such as social science, natural science, humanities and law by grouping majors according to characteristics. This categorization is widely used in the education field in Korea. Participants were asked to choose their undergraduate major in paper-based questionnaires. I then computed team’s major diversity by following the Blau (1977)’s index formula, \(1 - \sum p_i^2\), where \(p_i\) denotes the proportion of team’s members in the ith category. This resulted in a single variable with 9 different categories. The maximum and minimum diversity theoretically range from 0 to 0.889.

**Agreeableness** John, Donahue, and Kentle (1991)’s Big Five Inventory (BFI) was used to measure agreeableness. BFI has advantages over NEO-PI in terms of time. John et al. (1991) developed the BFI in response to the need for shorter tools for personality measurement. The BFI was constructed through the evaluation of the experts and the factor analysis verification. The main reason for the development was the development of efficient measurement tools that could be used in cases where additional differentiation of the big five factors was not
required. Simplifying the measurement tools not only reduces testing time but also helps prevent subjects from getting bored or tired. Although BFI has reduced the number of questionnaire items, there is no problem in terms of content coverage or psychometric properties (John & Srivastava, 1999). The BFI measures personality traits using short phrases including the typical adjectives of big five characteristics. This can help to overcome the problem of inconsistency that can occur when using single adjectives (Goldberg & Kilkowski, 1985).

John et al. (1991) reported correlations with NEO-PI scales from .84 for conscientiousness to .77 for openness. Participants responded to each item on a 5-point Likert scale ranging from 1 (“not at all descriptive of me”) to 5 (“very descriptive of me”). As mentioned earlier, I assumed that the characteristics of individual team members have the same impact on the team process, and I used the team profile model in this study. Consistent with previous studies (e.g., Oh et al., 2015; Ployhart, Weekley, & Baughman, 2006), the means of scores on agreeableness were calculated for each team to operationalize team-level variance in personality.

4.3.2. Control Variables

In this study, the number of team members, project term, creative thinking ability of the team, and diversity of age and gender were controlled. Previous studies have demonstrated that team size could benefit to performance of ill-defined tasks (Hülsheger et al., 2009). More members of team indicate that the
team has more diverse perspectives, knowledge, and skills. Therefore, the number of team members was controlled. Gender can affect team interaction, and thus, also on a team’s performance (e.g., Pearsall, Ellis, & Evans, 2008). Negative phenomena, such as emotional conflict (Randel, 2002) and social comparison (Pearsall et al., 2008), can be caused by difference of gender. For this reason, gender diversity of the team was also controlled. I further controlled for the project term which differ depending on the course to which the participants belong. Moreover, I control the heterogeneity of age among team members. Age differences could interfere with open communication between team members, especially in the Korean society where research has been conducted. The creative thinking ability of members was also controlled. In the field of creativity research, the cognitive thinking ability of individuals has been suggested as a factor that has a great influence on performance. Therefore, the creative thinking ability of individuals composed of divergent thinking and convergent thinking was controlled. Finally, I controlled CSE covariance among team members. This is because, even if the score is the same, different interaction characteristics may appear depending on whether or not CSE of the member is concentrated in a certain score range or dispersed. This approach, to control within group variation, follows that applied in several prior studies (e.g., Barrick et al., 1998; Goncalo et al., 2010).
5. RESULTS

In this study, the hierarchical regression analysis was used. First, the control variables were entered into a regression equation (step 1). The main effect variables (step 2) were entered in the second step. Since I predicted a curvilinear relationship between CSE and innovative performance at the team-level (Hypothesis 1), a quadratic term by squaring the score of aggregated CSE was generated and included in the regression equation (step 3). Next, to test the hypothesis that agreeableness and major diversity would moderate the relationship between CSE and innovative performance (Hypothesis 2, 3), I entered the relevant interaction terms in the model (step 4). In order to avoid multi-collinearity problems that might appear in the interaction effect analysis, mean-centered variables were used. Descriptive statistics are shown in Table 1.

Table 2 presents the result of the hierarchical regression analysis used to
test hypotheses. I predicted that aggregated CSE would have a curvilinear relation to innovative performance at the team level (Hypothesis 1). The results in model 3 showed the coefficient associated with this term was statistically significant ($\beta = -1.21, p < .05$). The coefficient of the quadratic term of aggregated CSE was negative, indicating the relation between aggregated CSE and innovative performance at the team level had an inverted U-shape, and Hypothesis 1 is supported.

I hypothesized that major diversity of the team would moderate the inverted U-shaped relation between aggregated CSE and innovative performance at the team level (Hypothesis 2). To test this prediction, I entered the relevant interaction terms (aggregated CSE$^2 \times$ major diversity and aggregated CSE $\times$ major diversity) of the regression equation. The coefficient associated this interaction term was statistically significant ($\beta = 18.92, p < .01$), and Hypothesis 2 is supported.

Finally, I predicted that agreeableness of team members would moderate the inverted U-shaped aggregated CSE-innovative performance relation (Hypothesis 3). To examine this hypothesis, the relevant interaction terms (aggregated CSE$^2 \times$ agreeableness and aggregated CSE $\times$ agreeableness) were entered into the regression equation. The coefficient associated this interaction term was statistically nonsignificant, and Hypothesis 3 is rejected.
6. DISCUSSION & CONCLUSION

This study investigated the possibility of a curvilinear relation between aggregated CSE and innovative performance at the team level. And, Moderating effects of major diversity and agreeableness on the relation between aggregated CSE and innovative performance were examined. The results demonstrated the inverted U-shaped aggregated CSE and innovative performance at the team level. This study has contributed to the innovation and organizational creativity literature by using an interactional approach (Woodman et al., 1993) to impart more precise understanding of the relation of team composition and team innovative performance. Sternberg and Lubart (1999) pointed out that to date creativity and innovation studies have been generally conducted at only one level of analysis at a time. In the meantime, due to the difficulties of research, team level research have been less studied than individual level in organizational creativity research field. Most of the studies, which conducted at the team level, focused on process variables or environmental variables rather than individual characteristics of team members. However, each team members are a fundamental factor in team creativity. The process of the team is ultimately the result of the interaction between the members. In this respect, it is important to study the relationship between individual characteristics of team members and innovation performance. Therefore, this study investigated the relationship between team members’ characteristics and team performance by aggregating individual characteristics of
team members. In particular, this study demonstrated that CSE, which have been emphasized only positive aspects at the individual level, may have a negative impact at the team level. CSE is positive in that it increases the motivation of individual's creative actions and reduces the loss of productivity that can occur during group discussions. However, because CSE relates to the escalation of commitment, self-productive attribution patterns, and less seeking of information, it can lead to negative impact on team interaction.

This study also examined the moderating effect of major diversity and agreeableness of team on the inverted U-shaped aggregated CSE-innovative performance relation. Consistent with previous findings, the results demonstrated that the moderating effect of major diversity of team members influencing these relationships. It presented that formal education is a critical factor to affect the knowledge, perspective and problem-solving skills and, in turn, has a positive effect on innovative performance. However, the moderating effect of team members' agreeableness was not supported. There is a possible explanation for this result. High agreeableness might negatively influence an individual creativity by causing adaptation in order to avoid conflicts with others (Barron & Harrington, 1981; King, McKee Walker, & Broyles, 1996).

This study has the following limitations. This study assumes that the characteristics of the team members influence the process of the team and, in turn, ultimately affect the innovative performance of the team. However, I could not
directly test the relation between team members’ characteristics and process variables such as conflicts, communication (internal and external), cohesiveness and psychological safety. This limitation may provide big opportunities for future research. It can contribute more to creativity and innovation literature by directly identifying the relationship between the characteristics of team members and these process variables. Second, although I developed the hypotheses based on the theory and demonstrated that the predictions were supported, there is a limitation to securing external validity due to using laboratory research method. For example, in an actual organization, surface-level diversity of organization members such as demographic variables may cause categorization, which may negatively affect the interactions among members. Third, since data used in this study were collected only in Korea, it is limited to generalize the results. It is necessary to confirm whether the same result is obtained in countries with different cultural characteristics from Korea, which emphasize values such as humility and elderly preference.

This study has the following managerial implications. First, it is necessary to concern CSE of employees in order to improve organizational creativity. Many companies are making efforts to improve the creativity of their organizations. Developing creative competencies is important, but it is also important for individuals to have belief in their own creative capabilities. It may be more efficient to inspire confidence in the creative capacity of an individual rather than
to train creative thinking capability. Self-concept variables, which is surface characteristics, are more malleable and are more easily affected by life events, contexts compared to personality traits (Asendorpf & Van Aken, 2003). Second, the negative effects of the CSE on team interaction should be taken into account. While CSE has advantages in terms of motivating creative actions of employees, it can negatively affect interaction among team members by causing behaviors like self-protective attribution pattern, escalation of commitment and less seeking of information as mentioned above. Efforts should be made to minimize these side effects.
TABLE 1. Descriptive Statistics and Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>1</th>
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<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Performance</td>
<td>7.03</td>
<td>1.11</td>
<td>4</td>
<td>10</td>
<td>-</td>
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<tr>
<td>2. CSE</td>
<td>5.43</td>
<td>0.36</td>
<td>4.48</td>
<td>6.54</td>
<td>0.17</td>
<td>-</td>
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<tr>
<td>3. Major diversity</td>
<td>0.58</td>
<td>0.15</td>
<td>0.00</td>
<td>0.78</td>
<td>0.17</td>
<td>0.08</td>
<td>-</td>
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<tr>
<td>4. Agreeableness</td>
<td>2.44</td>
<td>0.83</td>
<td>0.46</td>
<td>4.22</td>
<td>0.16</td>
<td>0.62*</td>
<td>-0.12</td>
<td>-</td>
<td></td>
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<tr>
<td>5. Age diversity</td>
<td>0.08</td>
<td>0.05</td>
<td>0.00</td>
<td>0.24</td>
<td>-0.08</td>
<td>0.09</td>
<td>0.02</td>
<td>-0.07</td>
<td>-</td>
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<tr>
<td>6. Team size</td>
<td>4.19</td>
<td>0.61</td>
<td>3.00</td>
<td>6.00</td>
<td>-0.15</td>
<td>0.15</td>
<td>0.14</td>
<td>0.15</td>
<td>0.15</td>
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<tr>
<td>7. Project period</td>
<td>7.93</td>
<td>3.54</td>
<td>3</td>
<td>12</td>
<td>0.23*</td>
<td>-0.05</td>
<td>0.32*</td>
<td>0.03</td>
<td>-0.21*</td>
<td>-0.03</td>
<td>-</td>
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<tr>
<td>8. Gender diversity</td>
<td>0.27</td>
<td>0.21</td>
<td>0.00</td>
<td>0.50</td>
<td>0.07</td>
<td>-0.08</td>
<td>0.28*</td>
<td>-0.10</td>
<td>0.05</td>
<td>0.10</td>
<td>-</td>
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<tr>
<td>9. Creative thinking capability</td>
<td>59.31</td>
<td>14.09</td>
<td>29.50</td>
<td>88.38</td>
<td>0.34*</td>
<td>0.06</td>
<td>0.15</td>
<td>0.13</td>
<td>-0.23*</td>
<td>-0.28*</td>
<td>0.53*</td>
<td>0.08</td>
<td>-</td>
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<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
<td>Model 5</td>
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<tr>
<td>CSE – (A)</td>
<td>0.556</td>
<td>0.715*</td>
<td>0.626*</td>
<td>1.072*</td>
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<td></td>
<td>(0.071)</td>
<td>(0.023)</td>
<td>(0.042)</td>
<td>(0.035)</td>
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<tr>
<td>(CSE)^2 – (B)</td>
<td></td>
<td>-1.214*</td>
<td>-2.309***</td>
<td>-0.0328</td>
<td></td>
<td></td>
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*p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
CHAPTER Ⅲ.
CREATIVE THINKING ABILITY AND INNOVATIVE PERFORMANCE AT THE TEAM LEVEL:
MODERATING EFFECTS OF PERSONALITY
1. INTRODUCTION

What determines the innovative performance of the firm? This is one of the most important questions in the field of strategic management research. As creativity has been emphasized as the foundation of innovation, research on creativity is increasing in management field (e.g., Gong, Kim, & Lee, 2013; Hirst, Van Knippenberg, & Zhou, 2009; Jia, Shaw, Tsui, & Park, 2014). In particular, the field that focuses on variables that can affect organizational performance is called organizational creativity by distinguishing it from traditional creativity research. Organization creativity is defined as "the creation of a valuable, useful new product, service, idea, procedure, or process by individual working together a complex social system" (Woodman et al., 1993). Woodman et al. (1993) suggested that systematic research on creative behavior of employees in a complex system such as firm can help the organizational science, because creativity may provide a key to understanding organizational change, effectiveness, eventually, survival.

Although research on organizational creativity has increased, there are still the following limitations. First, organizational creativity studies mainly used questionnaires to measure the creativity of employees. The questionnaire items used to measure the creativity of employee in organizational creativity research are not clear what the questions assess. In relation to the characteristics of individuals which influence creative performance, prior creativity research which was mainly studied in psychology can be divided into two approaches. The first is
an approach focused on the personality traits of the individual, and the second is an approach that focuses on the individual's cognitive ability. Nonetheless, previous organizational creativity research has been studied without a clear distinction between the two approaches. Assessment tools include questions about personality or disposition and questions about cognitive abilities or skills. Because these studies used ambiguous questionnaires, it is difficult to expect rigorous research results. This may be one important reason for inconsistent findings in organizational creativity research. In particular, there is a bigger problem when using the supervisor or peer evaluation in order to assess individual creativity. When a supervisor or co-worker measure the creativity of another employee, creativity is assessed based on creative performance during the observation period. However, individual creative performance is influenced by other external variables such as task characteristics, leadership styles of senior, organizational culture in addition to individual creative traits and cognitive thinking ability. Therefore, there is a limitation that the creative potential of individual employees cannot be measured precisely. Nevertheless, because of the difficulties of research, subjective methods (e.g., supervisor or peer evaluation) have been widely used. Cognitive thinking ability assessment is relatively more costly compared to subjective assessment based surveys. For this reason, the creativity of the individual was evaluated by using the question composed of 3 ~ 4 questions.

Second, team-level creativity research mainly focuses on climate or process
variables. There have been a few studies on how team members' creative abilities which is the fundamental source of team creativity are aggregated and affect team performance. Although a few studies (e.g., Pirola-Merlo & Mann, 2004; Taggar, 2002) investigated the relationship between team members’ creativity and team performance, there is a limitation that the creativity of members is measured by peer or supervisor evaluation method. In addition, there is no research on how to aggregate individual team members’ creative thinking capabilities whereas there is a study on the aggregation method of members’ intelligence or general mental abilities (e.g., Barrick et al., 1998). There are several methods (e.g., mean, variance, maximum, minimum) to aggregate the characteristics of team members. It is meaningful to look at the appropriate aggregation method for team member creativity. Third, previous studies overlooked the impact of individual member characteristics on climate or process in related to creative performance. In previous research, the climate variables or process variables were mainly assessed by asking each team members and averaging them. The basic factors that affect processes and climate are interactions among individual members. The micro attributes that influence interaction patterns or qualities are the personality traits of individual members (Somech & Drach-Zahavy, 2011), because personality determines the behavior, thought and communication style of an individual (Costa & McCrae, 1992). Nevertheless, a few studies have examined the personality characteristics of individual members in organizational creativity at the team level. This study
tried to overcome the limitations mentioned above by using laboratory research methods. First, I evaluated the creative thinking ability which is composed of divergent thinking ability and convergent thinking ability and analyzed the effect on team performance. Second, I examined the moderating effects of personality, especially extraversion and agreeableness, which were studied to have a direct effect on the interaction among team members.

The laboratory research method used in this study is different from the prior research as follow. In previous research using laboratory study, the group for the study was generally composed of college students who were not acquainted with each other and the task was conducted for a relatively short period time. And the task, which is assigned to team members, is not meaningful for them. Therefore, there was a difficulty in examining the effects of interaction among team members. In contrast, participants were assigned a project to be performed during one semester in this study. In addition, these research designs are differentiated from the previous laboratory research in terms of motivation because the project outcomes are reflected in the final grade at the end of the semester. Based on these methodological differences, this study examined the effects of creative thinking ability and personality traits in a model under control of external factors which may influence the performance.
2. LITERATURE REVIEW

2.1. CREATIVE THINKING ABILITY

Creativity research has increased rapidly after Guilford’s speech in 1950 at the American Psychological Association, which is the beginning of modern creativity research. Creativity research that has been mainly studied in the field of psychology is now conducted in various areas, including education, art, science, innovation and business. There are various definitions and theories of creativity because creativity is an inherently complex construct. The fact that creativity research is being conducted in various fields and using various empirical research methods have caused variations in the concept and definition of creativity. Nonetheless, most definitions of creativity have in common: 1) novel or original, 2) valuable or useful. In line with previous studies (Zhou & Shalley, 2003), I define creativity as “the production of novel and useful ideas concerning products, services, processes, and procedures by an employee”.

Creativity research is empirically divided into two approaches (Shalley & Zhou, 2008). One is the study of individual differences, and the other is the study of cognitive processes. The study of individual differences, which aimed to identify individual characteristics related to creative outcomes, can be divided into a study of a very small number of eminent people and a study of the ordinary population. Creativity research that focuses on great people who have shown very specific creative achievements has a long history. Early creativity studies have
explored lifelong biography of a person who has demonstrated eminent creativity in the realm of art or science. These studies attempted to find out the common characteristics of the great people who create creative achievements. Simonton (1975) studied the life of an artist, a scientist, and a philosopher and tried to understand the causal relationship between social variables and creativity. In recent years, research focusing on ordinary individual has become the mainstream. For example, (Joy P Guilford, 1959) conducted a study to identify and measure "creativity" traits. In addition, many researchers have tried to identify personality traits related to creative outcomes. Higher self-confidence, aggressiveness, and unconcern with social constraints were suggested with characteristics related to creative people.

The second research area is focused on cognitive processes when creativity emerges. Studies focused on creative processes aim to understand the characteristics of mental mechanisms that occur in the process of an individual's creative thinking or behavior. Many studies have focused on cognitive processes or skills. Various tests have been developed to measure these cognitive processes. Guilford developed the Alternative Uses Task, and building on it, Torrance developed Torrance Tests of Creative Thinking. TTCT is the most widely used assessment tool in the field of creativity.

This study focused on the cognitive process of creativity. It is hard to think that creative performance was achieved without cognitive process. The cognitive
theory emphasizes the creative process that underlies creative thinking. The creative thinking process is categorized into divergent thinking and convergent thinking. The divergent thinking happens when ideas or associations are made into various directions. As a result of divergent thinking, new and unique ideas are created (Mednick, 1962). Convergent thinking, on the contrary, means a process of thinking that finds one right answer based on a variety of information. Both divergent thinking and convergent thinking are related to creative thinking because they enable the production of unique and valuable ideas.

2.2. PERSONALITY

Personality is “a set of individual differences that are affected by the development of an individual: values, attitudes, personal memories, social relationships, habits, and skills” (Mischel et al., 2004). The personality of an individual is a subject that is studied extensively in the field of social sciences including psychology and business administration in that it affects how people think, feel and act (Costa & McCrae, 1992). Personality variables are mainly studied at the individual level. However, recently there is a growing body of research on how members' personal knowledge, skills, abilities, as well as other differences such as personality traits affect teams or organizations beyond individual performance (e.g., Oh et al., 2015; Ployhart et al., 2011; Ployhart et al., 2009). Human capital resource research suggests that the aggregated individual difference affect the performance of higher level unit through the emergence of
human capital resources (Ployhart et al., 2014; Van Iddekinge et al., 2009). Personality is one of the important microfoundations of human capital resources (Oh et al., 2015; Ployhart, 2012). In terms of the resource-based theory of the firm, the personality traits of the members are heterogeneous for each company, and these heterogeneities can be management resources that can affect the performance of the company.

Organizational creativity assumes interactions within a complex social system (Woodman et al., 1993). Creative achievement is influenced by social and environmental factors (Amabile, 1983). Since Amabile (1983) highlighted the importance of social and environmental factors, research on climate, which positively affects creativity, and process variables has increased (e.g., Hülsheger et al., 2009). These studies were conducted by surveying individual members of the team or supervisors to measure process variables. However, it is meaningful to investigate the direct relationship between the team members’ personality and performance, because individual members’ personality is the most basic components affecting the interactions and processes among the team members.

The input-process-output model is a representative model that describes the mechanism for team-performance relationships (Barrick et al., 1998). This model suggests that the various inputs are gathered to influence the processes in the group, which in turn affect the performance (output) of the team. Personality is a representative factor of individual level, and it is a factor that has a decisive
influence on interactions among team members.

The five-factor model (FFM) is a representative framework for characterizing personality (Goldberg, 1993). FFM describes the personality using five factors: extraversion, agreeableness, conscientiousness, emotional stability and openness to experience. Personality theory assumes that these five factors are relatively stable over a lifetime and that each factor causes humans to behave in a particular way (McCrae & Costa Jr, 1997; Robertson & Callinan, 1998). The FFM has been used as a comprehensive and robust framework for research on personality (Mount et al., 1998).

The Five-Factor model distinguishes the personality by five-factor: extraversion, agreeableness, conscientiousness, emotional stability and openness to experience. Barrick et al. (1998) argued that extraversion and agreeableness are the factors that directly affect interaction with others. This study assumes that personality traits affect the interaction of team members and, in turn, ultimately moderate the relationship between team members’ creative thinking capabilities and team-level performance. For this reason, I focused on the extraversion and agreeableness among the big five personality traits.

3. HYPOTHESES

3.1. Creative Thinking Ability and Innovative Performance

Organizational creativity, distinguished from traditional creativity which is generally studied in psychology, refers to the field of creativity research which
exclusively focuses on factors that directly influence the performance of the firm. In organizational creativity, creativity is mainly studied in relation to innovation. As innovation is seen as a determinant of the competitiveness of a company and its survival in a business environment of high uncertainty, research on creativity and innovation is increasing in the field of management. In previous research, employee creativity was considered as an important element for not only organizational innovation (Shalley et al., 2004), but also a minor change in organizations (Madjar, Greenberg, & Chen, 2011). Innovation is a fundamental factor in creating new value and maintaining a competitive advantage. Constant innovation is required to the organization in order to respond to changes in customer needs and to capture opportunities arising from technological and environmental changes. As innovation has been emphasized, different definitions of innovation have been proposed by scholars. In this study, I use the definition of Baregheh, Rowley, and Sambrook (2009), which integrates definitions of innovations presented in various fields through contents analysis. "Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace." (p. 1334)

Generally, the relationship between creativity and innovation is regarded as a sequential process or a subset relationship. In other words, while creativity is seen as the creation of novel and useful ideas, innovation is presented as a concept that
encompasses the stages of creating these ideas and implementing them (Oldham & Cummings, 1996). Some researchers suggest that creativity does not only occur in the early stages of the innovation process but that the creation and execution of ideas is a cyclical, recursive process. Nevertheless, it is common to see creativity as the first step of innovation, in that creativity emphasizes the creation side of ideas, and innovation emphasizes the execution side of ideas (Anderson, Potočnik, & Zhou, 2014; Mumford & Gustafson, 1988).

Individual creative potential has been traditionally regarded as cognitive abilities. J. P. Guilford (1950) suggested creative thinking ability as a distinct construct. Since then, divergent thinking has been regarded as the core of creative thinking and used as a key consideration for creativity measurement and research (Woodman et al., 1993). Many creativity measurement tools measure creativity-relevant skills or processes of creative thinking (e.g., Torrance Tests of Creative Thinking, Remote Associates Test). TTCT is one of the most popular and widely used measurement tools in the field of creativity research. TTCT is typically an assessment tool that measures the individual’s divergent thinking ability. Divergent thinking means a cognitive process that helps to create various responses or responses to open problems. A high level of cognitive thinking in relation to creativity means that he or she can present more, unique, flexible, and sophisticated about the same information and stimulus to the problem situation. This can ultimately have a decisive impact on delivering better creative results.
These individual creative thinking abilities have a significant impact on team performance. Teams are widely used as the basic unit to get work done in modern organizations. The importance of a team is especially prominent in areas where creative problem solving is needed such as R&D and marketing. The reason for the increased use of teams in a modern organization, especially in areas where creative thinking is required, is the belief that the performance of team composed of individuals is greater than a simple sum of individuals. It is clear that the more solutions and ideas to the problem are, the better the results will be obtained. Creative process is considered a “bisociative process” - linking two things that previously seemed to be irrelevant. The synergy of team creativity occurs when members share their thoughts and criticize each other's thoughts. Such interactions are a core source of team creative synergy, but eventually, each member decides the amount and quality of such interaction. The creative thinking ability of the team members constituting the team is the key antecedent factor of the innovation performance of the team. Team members with diverse ideas, knowledge, and experience can stimulate each other's thoughts. For this reason, team members who have creative thinking ability to present various ideas can improve the performance of the team.

In this study, I propose a multilevel model of team creativity which considers team creativity as the aggregation of individual creativity. Team composition research focuses on how to relate the traits of team members to team performance
and processes. To elevate lower-level characteristics to higher-level characteristics, the nature of task and the specific traits of individual should be taken into account. Kozlowski and Klein (2000) suggested two general types of aggregation processes. Compositional process means relatively simple aggregation rules such as average or diversity (variance) which assume that all lower-level components are considered equally. Compilation model refers to the aggregation that uses complex combination of lower-level traits. This model assumes that some members who occupy certain role or positions have a greater impact on team performance.

In order to choose the appropriate aggregation method, the nature of the task must also be considered. The task structure determines how to integrate the individual creative contribution to team-level performance. Steiner (1972) suggested appropriate operationalization methods for each task type. Steiner (1972) classified the types of tasks into additive, compensatory, conjunctive, disjunctive, and suggested respectively sum, average or variance, lowest and highest as appropriate operationalization methods. First, this study does not select the leader of the team, so it is reasonable to consider that all members have equal influence on team performance. Second, it is appropriate to aggregate team members’ creative thinking ability by averaging then in a typical interdependent project that takes place over a relatively long period of time. Pirola-Merlo and Mann (2004) showed that most of the variance in team creativity was accounted for by the average individual team members’ creativity rather than other operationalization
such as maximum and minimum aggregation functions. For these reasons, I proposed the following hypothesis.

_Hypothesis 1. The innovative performance at the team level will be positively correlated with average team member creative thinking capability._

### 3.2. Personality

#### 3.2.1. Extraversion

Extraversion means the tendency to seek interpersonal stimulation (Lievens, Ones, & Dilchert, 2009). Extraverts are enthusiastic, active, sociable, optimistic, warm, energetic, vigorous, talkative, assertive, fun-loving, positive, and tend to like working with others (Barrick et al., 1998; Lievens et al., 2009). Extravert likes and seeks to the situation in which they can communicate with others. Ferguson, Sanders, O'Hehir, and James (2000) demonstrated that extravert gets better performance in the case of tasks that require interaction. Furnham and Medhurst (1995) demonstrated that extraverts received better grades in seminar classes where interaction among colleague and professor by studying the relationship between personality and seminar performance for 72 college students. Lievens et al. (2009) examined the relationship between personality traits and performance through longitudinal analysis of medical students. The results showed that extraversion has a negative relationship in preclinical years where personal
intensive learning (e.g., memorization of facts) is important. However, extraverts showed good academic performance during clinical years which required more interaction with patients and colleagues.

Characteristics related to extraversion have a positive impact on team member interaction. The synergy of the team in relation to creativity comes from the open communication among team members. Even if each team member has creative thinking ability, synergy does not occur unless they actively participate in team discussion. The assertive, confident, and talkative nature of extravert induce open communication by reducing concerns about the negative evaluation of team members (Barry & Stewart, 1997). The extraverts participating more actively in the group discussion influence the formation of the group norm (Feldman, 1984). This group norm can create an open communication atmosphere between team members, which can have a positive effect on team-level performance. Optimistic and enthusiastic aspects of extraverts also affect interaction pattern. Ford (1996) argues that in the model of individual creative action, an employee must choose between two competing options that either work creatively or follow existing routines. Bandura (1986, 1997) argued that an individual is motivated when someone has the ability to perform a specific task and expects to achieve the desired outcome in social cognitive theory. That is, when there is a belief that a task can be accomplished successfully, the behavior is triggered. From this perspective, the optimistic and enthusiastic aspect of extraverts can affect the
choice of creative behavior. McCrae and Costa (1987) showed that extraversion is related to positive affectivity. Positive affectivity has positive effects on team performance, for example, greater satisfaction with team and lower absenteeism (George & Bettenhausen, 1990). This can also be seen as a positive influence on team interaction. Based on these reasons, I proposed following hypotheses:

**Hypothesis 2.** The innovative performance at the team level will be positively correlated with average of team member extraversion.

**Hypothesis 3.** The relation between average team member creative thinking capability and team innovative performance is moderated by average of team member extraversion such that team member creative thinking ability is more positively related to team innovative performance when average of team member extraversion is high than when it is low.

### 3.2.2. Agreeableness

Agreeableness, which refers to a tendency to be cooperative, helpful and compassionate towards others, is related to team interaction. Barrick et al. (1998) demonstrated that high agreeableness affects to team effectiveness positively. Characteristics such as helpful, trusted, friendly, tolerant (Costa & McCrae, 1992) and non-competitive (Graziano et al., 1997) possessed by team members with high agreeableness can make a favorable effect on team process. Graziano et al. (1997)
demonstrated that agreeableness is related to more positive perception from the opposing idea. Jackson et al. (1992) argued that people who have a high level of agreeableness have the ability to effectively mediate opposing ideas. Mount et al. (1998) demonstrated that agreeableness of employee has a positive relationship with the performance of the team which needs interaction between team members.

In resource-based view, various perspectives that team members have can be a resource that benefits the team creativity (Jackson, 1992). Synergy for team creativity occurs when knowledge, viewpoints, and experience of team members stimulate each other’s thoughts. In other words, it is necessary to share and integrate the ideas and viewpoints of each other. In addition, it is important to integrate various ideas without conflict. Team performance is always influenced by coordination cost or motivational loss in group interaction. To realize the benefits of team, effective coordination and integration of several ideas are very important. Shin and Zhou (2007) argued that a shared belief about psychology safety among team members. Team members may be reluctant to reveal their thoughts because of anxiety of being rejected (Mumford & Gustafson, 1988). The attributes associated with high agreeableness can influence psychological safety positively, and help members reduce those fears. The attributes associated with high agreeableness can help team members collaborate. This can ultimately benefit the team’s performance. A team composed of members with high agreeableness can choose a better alternative. Based on the above argument, I
develop the following hypothesis.

**Hypothesis 4.** The innovative performance at the team level will be positively correlated with average of team member agreeableness.

**Hypothesis 5.** The relation between average team member creative thinking capability and team innovative performance is moderated by team member's average agreeableness such that team member creative thinking ability is more positively related to team innovative performance when average team member agreeableness is high than when it is low.

4. **METHOD**

4.1. **Research Setting**

In order to test the hypothesis of this study, laboratory research method was used. 200 undergraduate and 223 MBA students participated in this study. 72.3 percent of the participants were women and participants’ average age was 31.39 years (s.d. = 9.14). The instructor formed seven to ten project teams per semester and participants were randomly assigned to one of them. This resulted in a total of 101 teams. 30 percent of a participant’s overall course grade was allocated to his or her teams’ output over 3-, 6-, and 12-week periods. All teams performed the same project to generate creative business ideas during the semester. During the
project, each team constantly develops ideas through active interaction among the members. At the end of the semester, each team has to present their final ideas.

The setting of this study has the following advantages over the existing laboratory research. Team creativity research using laboratory study has generally involved single-part tasks to evaluate team outputs or performance. Single-part tasks often require individuals to "ideate names or uses or consequences of a thing, or ideate ways to achieve a goal" (Brophy, 1998) in short-lived teams in contrived laboratory settings. Team tasks in this study differed from previous studies in several ways: interactive teams completed a multi-part and open-ended assignment over a relatively long period with constraints that required the efficient management of time and other inputs. As is the case in many venturing projects, tasks involved problem identification of existing products and/or services, generating new innovative options and alternatives, evaluations of multiple options, seeking additional information, conducting market research, and building consensus on how to best develop commercial solutions. While the assignments in most previous creative problem-solving research often minimize or eliminate the need for intervening team creativity-relevant processes, such as challenging existing assumptions, this study used more realistic tasks that called for these behaviors.

For evaluating innovative performance of the team, product based assessment was used. Amabile (1983) argued that product-based operationalization is
appropriate for two reasons. First, process-based operationalization is not feasible because of research design and the current state of psychological theory. Second, and more importantly, product based assessment is reasonable since final product shows the total sum of creativity and interaction of the members. In this study, product, new business idea, was assessed by the professor of course at the end of each semester. Because creativity is regarded to be historically, culturally and socially bound (Amabile et al., 1996), previous research suggests that assessment from appropriate judges is important (Zhou & Shalley, 2003). Professor with specialized domain-specific knowledge could be an appropriate assessor. Given domain-specific knowledge and a non-supervisor/employee relationship, experts are more objective. The final score ranged from 1 to 10.

4.2. Aggregation Model

The unit of analysis in the present study was the team. In this study, all hypotheses were presented at the team level, and the variables used in the analysis were calculated by converting the variables assessed at the individual level to the team level. (Rousseau, 1985). In the multilevel theory, an aggregation model that translates variables measured at a lower level into higher-level variables can be broadly divided into a team profile model and a relative contribution model (Mathieu, Tannenbaum, Donsbach, & Alliger, 2014). Appropriate aggregation methods should be chosen to take into account the characteristics of the task and the nature of the variables being aggregated. In the case of team profile model,
team level variables are calculated by utilizing descriptive statistics of member characteristics (e.g., mean values or some diversity indices). All the characteristics of the individual members are equally treated. Team profile model assumed that the influences of team members are equal. On the other hand, the relative contribution model suggested that the performance of the team is more influenced by some of the team members. Some members may have a greater influence on team performance, due to their position or role. Appropriate aggregation methods should be judged by considering the characteristics of the task to be performed and how the phenomenon of the lower level is expressed at the higher level (Kozlowski & Klein, 2000). Given the research setting in which participants were randomly organized and no one was selected as a leader, it is appropriate to assume that all participants have equal power.

4.3. Measures

4.3.1. Independent Variables and Moderator

Creative Thinking Ability Previous studies on creativity at the team level has largely relied on subjective evaluation by supervisors, peers or by self. However, as mentioned above, these measurement methods have difficulty in evaluating only the individual creative ability itself. In this study, individual creative ability was assessed in terms of cognitive process by using paper-based assessment tool. All participants in this study completed a paper-based test developed by a Korean research institute (Park et al., 2016). This measurement
assessed the creative thinking ability which is composed of divergent thinking and convergent thinking. Divergent thinking means the ability to generate various, unique answer to a single stimulus. Divergent thinking is widely used to assess cognitive thinking ability in creativity research because it is good estimator for creative performance of the future (Runco & Acar, 2012). Convergent thinking focuses on finding one best answer to a clearly defined question. Convergent thinking refers to cognitive process to find one single best answer to a given question. As illustrated by the definition of creativity, idea or outcome must be new, but worthwhile for innovation. Therefore, in order to be creative, it is necessary to balance two kinds of thinking (Lonergan, Scott, & Mumford, 2004). The team profile model was used to evaluate the creative thinking ability of the team. In the case of team profile model, team level variables are calculated by utilizing descriptive statistics of member. In this study, team members’ creative thinking ability was evaluated, and the average of these scores was converted into team's creative thinking ability.

**Personality (Agreeableness and Extraversion)** John et al. (1991)’s Big Five Inventory (BFI) was used to measure agreeableness. BFI has advantages over NEO-PI in terms of time. John et al. (1991) developed the BFI in response to the need for shorter tools for personality measurement. The BFI was constructed through the evaluation of the experts and the factor analysis verification. The main reason for the development was the development of efficient measurement tools.
that could be used in cases where additional differentiation of the big five factors was not required. Simplifying the measurement tools not only reduces testing time but also helps prevent subjects from getting bored or tired. Although BFI has reduced the number of questionnaire items, there is no problem in terms of content coverage or psychometric properties (John & Srivastava, 1999). The BFI measures personality traits using short phrases including the typical adjectives of big five characteristics. This can help to overcome the problem of inconsistency that can occur when using single adjectives (Goldberg & Kilkowski, 1985).

John et al. (1991) reported correlations with NEO-PI scales from .84 for conscientiousness to .77 for openness. Participants responded to each item on a 5-point Likert scale ranging from 1 (“not at all descriptive of me”) to 5 (“very descriptive of me”). As mentioned earlier, I assumed that the characteristics of individual team members have the same impact on the team process, and I used the team profile model in this study. Consistent with previous studies (e.g., Oh et al., 2015; Ployhart et al., 2006), the means of scores on personality were calculated for each team to operationalize team-level variables.

4.3.2. Control Variables

In this study, the number of team members, project term, major diversity of the team, and diversity of age and gender were controlled. Previous studies have demonstrated that team size could benefit to performance of ill-defined tasks (Hülsheger et al., 2009). More members of team indicate that the team has more
diverse perspectives, knowledge, and skills. Therefore, the number of team members was controlled. Gender can affect team interaction, and thus, also on a team’s performance (e.g., Pearsall, Ellis, & Evans, 2008). Negative phenomena, such as emotional conflict (Randel, 2002) and social comparison (Pearsall et al., 2008), can be caused by difference of gender. For this reason, gender diversity of the team was also controlled. I further controlled for the project term which differ depending on the course to which the participants belong. Moreover, I control the heterogeneity of age among team members. Age differences could interfere with open communication between team members, especially in the Korean society where research has been conducted. Major diversity of team members were also controlled. The source of the synergy of team creativity is various perspectives, knowledge, experiences of team members. Education and work experience are the most typical ways to acquire knowledge (Tierney & Farmer, 2002). Individuals are exposed to different perspectives, knowledge bases and problem-solving skills according to their major in education period.

5. RESULTS

In order to test hypotheses, I analyzed the data using hierarchical linear regression. On the first step, the control variables were entered in the regression equation. Next, I introduced main effect variable, creative thinking ability at the team level, because I predicted teams’ creative thinking ability would positively influence innovative performance at the team level. In order to test main effect and
moderating effect of extraversion and agreeableness on the relation between creative thinking ability and innovative performance, I entered personality variable in order, respectively. In order to avoid multi-collinearity problems that might appear in the interaction effect analysis, mean-centered variables were used. Descriptive statistics and correlation matrix are presented in Table 3.

Insert Table 3 about here

Insert Table 4 about here

Table 4 shows the result of the hierarchical regression analysis used to test hypotheses. I presented hypothesis that creative thinking ability would be positively related to teams’ innovative performance (Hypothesis 1). The results demonstrated that a positive significant linear effect of creative thinking ability on team performance ($\beta = 0.02, p < .05$). I hypothesized that extraversion have a positive relation to innovative performance at the team level (Hypothesis 2). The results showed a positive but only marginally significant linear effect of
extraversion on team performance ($\beta = 0.25, p < .10$), Hypothesis 3 is partially supported. In model 4, I entered the relevant interaction terms (creative thinking ability $\times$ extraversion) to test the moderating effects of extraversion on the relationship between creative thinking ability and innovative performance (Hypothesis 3). The coefficient associated this interaction term was not statistically significant, and Hypothesis 3 is not supported.

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Insert Table 5 about here

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Table 5 presented the results of the hierarchical regression analysis on agreeableness. I predicted that agreeableness would be positively related to innovative performance at the team level (Hypothesis 4). The results presented that a positive but only marginally significant linear effect of agreeableness on team performance ($\beta = 0.25, p < .10$). Finally, I hypothesized that agreeableness would be moderate the relation between creative thinking capability and innovative performance at the team level (Hypothesis 5). To test this hypothesis, I introduced the interaction terms (creative thinking ability $\times$ agreeableness). The coefficient associated this interaction term was statistically nonsignificant, and Hypothesis 5 is not supported.
**Post hoc Analysis** I hypothesized that the social characteristics of extraversion would have a positive effect on interactions among members. Some studies have suggested that the dominance characteristics of extraverts may have a negative effect on interaction of the team, because too many extraverts can have a negative impact on team interaction and performance. Barry and Stewart (1997) argued that too many extraverts in team interfere with maintaining focus on task performance in the group's problem solving process. Extraverts have a characteristic of outgoing and talkative (Costa & McCrae, 1992), so they tend to pursue pleasurable social interaction at the expense of efficient task management. Another characteristic of Extravert is dominant and assertive. Therefore, extraverts show tendency to take position as leader rather than follower (Barry & Stewart, 1997). Leadership is a necessary factor to improve group performance, but too many leaders can have a negative impact on interaction between team members. Studies on the status of members in a group suggest that too many dominant members tend to cause conflict. The balance between leader and follower is important, but extraverts are not good followers (Smelser, 1961). Therefore, I analyzed the main effect of variance of extraversion on innovative performance and the moderating effect of variance of extraversion on the relationship between creative thinking ability and innovative performance. Table 6 shows the results of the post hoc analysis. The results showed nonsignificant
effects of variance of extraversion.

6. DISCUSSION & CONCLUSION

The aim of this study is to analyze the effect of creative thinking ability of team members on team innovation performance using multilevel approach. The contribution of this study is as follows. First, I clearly focused on creative thinking ability of team members. In the existing organizational creativity study, the creativity of the individual was measured mainly by subjective evaluation methods (e.g., supervisor, peer, self-evaluation). These evaluation methods have the following limitations. First, the subject to be measured by the questionnaire is not clear. Past creativity research clearly distinguishes between creative trait (personality) and creative thinking ability (cognitive process). However, there are several previous studies in which questions about traits and cognitive ability related to creativity are mixed in a single study. In addition, if a peer or supervisor evaluate colleague or employee, it is also problematic that the evaluation is likely to be based on the creative performance over the past period. However, creative
performance is influenced not only by individual creative thinking ability and creative personality but also by various external environments such as characteristics of given task, leadership characteristics of supervisor, organizational culture. Therefore, it is problematic to compare the evaluation results of people belonging to different organizations or teams. In addition, subjective assessments tend to receive higher scores than objective assessments (Park et al., 2016). Nevertheless, these research methods have been mainly used because it is costly and time consuming to evaluate the cognitive thinking ability of individual members. In particular, it is more difficult to evaluate the thinking ability of individual members in the case of team-level research. In order to overcome these limitations, this study measured the creative thinking abilities of team members using laboratory research methods. It is meaningful to analyze the relationship between creative thinking ability and innovation performance of team level through empirical analysis. Next, the effects of the personality traits of the team members on the innovation performance and the moderating effect on the relation between creative thinking ability and innovative performance were analyzed. Previous team-level studies focused primarily on process variables and environmental factors. However, it is meaningful to look at the influence and moderating effects of individual personality on performance, given that individual factors are the main causes of process, and that personality is the important antecedents that affect individual behavior and thinking. In this study, I analyzed
the main effects and moderating effects of personality by aggregating personality characteristics of individual members. Consistent with previous research, it was confirmed that extraversion and agreeableness, which were closely related to interaction, positively affect team performance. However, interaction effects were not supported.

This study also has the following limitations. First, there are limitations in terms of external validity because of using laboratory research methods. This study assumes that all members have the same influence in the process of conducting a team project. But in real workplace, certain individuals can have more influence depending on the position. Even in the same position, they can have different impacts on team dynamics depending on their capabilities. For example, a member who has performed well during the past period may have a greater impact in the course of performing a creative task. In this case, individual members with the highest competence may have a greater impact on performance. In this situation, operationalization method using average may not be appropriate. In addition, there may be a generalization problem in that research has been conducted on Koreans. Korea belongs to a Confucian culture that emphasizes the virtues of humility and concession. In countries with different cultural characteristics, different interaction characteristics can occurred. Second, I did not directly measure process variables as mediators. This study assumes that the characteristics of the team members influence the process of the team and, in turn, ultimately affect the innovative
performance of the team. However, I could not directly test the relation between team members’ characteristics and process variables such as conflicts, communication (internal and external), cohesiveness and psychological safety. This limitation may provide big opportunities for future research. It can contribute more to creativity and innovation literature by directly identifying the relationship between the characteristics of team members and these process variables.
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TABLE 4. Results of Hierarchical Regression Analyses

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| N                   | 101      | 101      | 101      | 101      |
| adj. $R^2$          | 0.03653  | 0.07951  | 0.10681  | 0.10411  |
| F                   | 1.632    | 2.234    | 2.495    | 2.291    |

$p$-values in parentheses

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
<table>
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<td>F</td>
<td>1.632</td>
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</table>

*p-values in parentheses
† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
<table>
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<th>Model 2</th>
<th>Model 3</th>
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<tr>
<td>CTC - (A)</td>
<td>0.0219* (0.022)</td>
<td>0.0202* (0.038)</td>
<td>0.0259 (0.099)</td>
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<td>Ext. var. - (B)</td>
<td></td>
<td>-0.0909 (0.326)</td>
<td>-0.0886 (0.340)</td>
<td></td>
</tr>
<tr>
<td>(A)*(B)</td>
<td></td>
<td></td>
<td>-0.00256 (0.642)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.347 (0.891)</td>
<td>0.293 (0.907)</td>
<td>0.147 (0.953)</td>
<td>0.308 (0.903)</td>
</tr>
<tr>
<td>diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team size</td>
<td>-0.311 (0.093)</td>
<td>-0.181 (0.338)</td>
<td>-0.143 (0.459)</td>
<td>-0.143 (0.460)</td>
</tr>
<tr>
<td>Project</td>
<td>0.0544 (0.109)</td>
<td>0.0120 (0.751)</td>
<td>0.0152 (0.688)</td>
<td>0.0175 (0.648)</td>
</tr>
<tr>
<td>Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.0380 (0.945)</td>
<td>-0.0388 (0.942)</td>
<td>-0.0134 (0.980)</td>
<td>-0.0495 (0.928)</td>
</tr>
<tr>
<td>diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>1.040 (0.181)</td>
<td>0.970 (0.202)</td>
<td>0.911 (0.231)</td>
<td>0.828 (0.291)</td>
</tr>
<tr>
<td>Diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE cov.</td>
<td>0.916 (0.656)</td>
<td>1.220 (0.546)</td>
<td>2.257 (0.323)</td>
<td>2.416 (0.297)</td>
</tr>
<tr>
<td>N</td>
<td>101</td>
<td>101</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>adj. $R^2$</td>
<td>0.03653</td>
<td>0.07951</td>
<td>0.07928</td>
<td>0.07139</td>
</tr>
<tr>
<td>F</td>
<td>1.632</td>
<td>2.234</td>
<td>2.076</td>
<td>1.854</td>
</tr>
</tbody>
</table>

$p$-values in parentheses

$\dagger p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$
CHAPTER IV. OVERALL CONCLUSION
This study examined the effects of creativity-related characteristics of team members on innovative performance at the team level beyond individual level. In the first study, I investigated the impact of creative self-efficacy on team performance. Previous studies related to CSE have focused on positive aspects of CSE. Although CSE helps in reducing the productivity loss such as evaluation apprehension, social loafing and production blocking that occurs in group discussion, it is also associated with negative effects such as escalation of commitment, self-productive attribution patterns, and less seeking of information from critics. For this reason, I proposed the inverted-u shaped relationship between aggregated CSE and innovative performance at the team level. And the hypothesis was statistically supported. The second study empirically analyzed the relationship between creative thinking ability of individual team members and innovative performance at the team level. Team-level research in organizational creativity research field was described as "jungle of inconsistent finding" (Anderson et al., 2014). This is partly due to the method of measuring the creativity of the members. In most of the existing organizational creativity studies, creativity of individual team members has been evaluated by supervisor or colleagues, or by self-evaluation. Therefore, this study focused on the creative thinking ability of the individual members exclusively and examined the relationship between team performance beyond individual performance. As a result of the statistical analysis, the creative thinking ability of the individual members composed of divergent
thinking and convergent thinking showed a positive correlation with the innovation performance at the team level.

This study is meaningful in that it expanded the understanding of organizational creativity by studying the team creativity which had been studied relatively less than individual level. In particular, I have found that CSE that have been studied focusing on positive effects on performance at the individual level can have different effects at the team level. The second study is meaningful in that it confirms empirically the effect of the creative thinking ability of the members on the performance of the team. This relationship has been difficult to verify empirically due to the research method. The managerial implications of this study are as follows. The result of this study suggested another evidence of the importance of the right composition of the team. Practitioners should consider not only the personality of the member but also CSE as a tool of human resource management such as selection or placement. Second, managers should be aware of the importance of managing CSE of their members. It may be more effective to extend self-efficacy on creativity than try to improve creative thinking abilities of employees. Asendorpf and Van Aken (2003) argued self-concept variables such as CSE are more malleable by contexts relative to hardcore characteristics of people.

This study also has the following limitations. First, this study used laboratory research methods, it has limitations in obtaining external validity. This study assumes that all members have the same influence in the process of team project.
However, in a real workplace, some employees can have a greater influence depending on the position, given role or capabilities. For example, a member who has performed well during the past period may have a greater influence in the course of performing creative tasks. In this case, individual members with the highest competence may have a greater impact on team performance than the manipulation of the average creative ability of individual members. Second, this study has limitations in terms of generalization because it used the only Korean sample. Korea belongs to a Confucian culture that has the virtue of humility and concession. In other countries with different cultural characteristics, results may differ from this study. Finally, there is a limit to not directly measuring process variables such as conflicts or psychological safety. The individual characteristics of the team members would ultimately lead to performance through the mediating variables mentioned above. In a future study, a more integrated understanding will be obtained if the research model includes personal characteristics, process variables, and performance of the members in line with the input-process-output model which is “a dominant way of thinking about teams” (Barrick et al., 1998).
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조직 창의성과 혁신 성과에 관한 연구:
팀 구성원의 특성을 중심으로

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환경 변화 속도가 빨라지고 기업 간 경쟁이 심화됨에 따라 혁신의 중요성이 더욱 강조되고 있다. 이러한 상황에서 혁신의 원천으로서 조직 구성원의 창의성을 주제로 한 연구가 경영학 분야에서도 증가하고 있다. 창의성 연구는 분석 단위에 따라 개인, 팀, 조직 수준으로 나눌 수 있다. 본 연구는 이 가운데 팀 수준에 초점을 맞추었다. 팀은 현대 조직에서 업무가 수행되는 조직의 기본 단위로서 널리 활용되고 있다. 특히 연구개발, 디자인 등 조직 수준의 성과에 큰
영향을 미치는 팀들이 수행하고 있는 과업들은 일반적으로 창의성이 요구되는 경우가 많기 때문에 팀 수준의 연구는 조직 창의성 연구에서 중요한 분석 단위라 할 수 있다. 이러한 이유로 팀 수준의 창의성 연구가 증가하고 있음에도 불구하고, 여전히 개인 수준의 연구에 비교해 부족한 실정이다. 그뿐만 아니라 지금까지 이루어진 팀 수준의 조직 창의성 연구들은 주로 창의성에 영향을 미치는 외부 환경이나 프로세스에 초점을 맞추고 있어, 정직 팀 창의성의 원천인 팀 구성원 개개인의 특성은 상대적으로 간과해 왔다는 한계가 있다. 이에 본 연구는 창의성과 관련한 팀 구성원의 특성이 개인 수준의 성과를 넘어 팀 수준의 성과로 어떻게 연결되는지 확인해 보았다.

첫 번째 연구에서는 근래에 관심이 증가하고 있는 개인의 창의적 자기 효능감이 팀 수준의 성과에 미치는 영향에 대해 분석하였다. 그동안 수행된 창의적 자기 효능감에 대한 연구들은 주로 창의적 자기 효능감의 긍정적인 조점을 맞추었다. 하지만 창의적 자기 효능감은 몰입의 상승(escalation of commitment), 자기 보호적 귀인(self-protective attribution), 정보 획득 노력 감소(less seeking of information) 등 팀 구성원간의 상호작용에 부정적인 특성과 관련 있기도 하다. 이에 본 연구에서는 종합된(aggregated) 개별 팀 구성원의 창의적 자기 효능감과 팀의 혁신 성과의 역 U형 관계에 대한 가설을 설정하였고, 이를 지지하는 결과를 확인하였다. 두 번째 연구에서는 인지적 프로세스 관점에서, 팀 구성원의 창의적 사고능력과 혁신 성과의 관계를 실증적으로 분석하였다. 지금까지 수행된 팀 수준의 창의성 연구는 서로 일관되지 않은 결과를 보여주는데 경우가 적지 않았다. 이는 창의성 측정의 어려움에서 기인하는 부분이 크다고 할 수 있다. 기존의 조직 창의성 연구들은 대부분 조직 구성원의 창의성을 상급자나 동료 혹은 본인 스스로 주관적으로 평가하는 방식으로 측정하였다. 이에 본 연구에서는 철저히 개인의 인지적인 창의적 사고 능력에 초점을 맞추어 이를 측정하고 성과와의 관계를 살펴보았다. 통계 분석 결과를 통해 발산적 사고와 수렴적 사고로 이루어진 개별 구성원의 창의적 사고 능력과 팀 수준의 혁신
성과는 정의 관계를 갖는 것으로 확인되었다.

주요어: 조직 창의성, 혁신 성과, 창의적 자기 효능감, 팀 구성, 다양성, 창의적 사고 역량

학번: 2014-30163