

Top management team characteristics and organizational creativity

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Abstract Drawing on the upper-echelon perspective, we investigated the impact of top management team (TMT) characteristics on organizational creativity. An organizational creativity index was used as a dependent variable to examine creativity at the organizational level. The results of the statistical analysis generally supported our hypotheses. The size of the TMT had a significant and negative impact on organizational creativity. The average age of the TMT was also negatively associated with organizational creativity. However, functional diversity of the TMT had a significantly positive impact on organizational creativity. These findings have important conceptual and practical implications. This study increased our understanding of the relationship between TMT characteristics and organizational creativity by introducing TMT characteristics as antecedents of factors influencing organizational creativity. This study suggests fruitful avenues for further research of this important yet understudied topic and useful managerial tools for composition of an adequate board for enhancing organizational creativity.

Keywords Top management team · Organizational creativity · Diversity · Board composition

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1 Introduction

Recent years have seen a surge of interest in creativity. Creativity management has become a popular trend among leading business firms such as Gore, Whole Foods, Google, P&G, IDEO, McKinsey, and Boeing (Hamel 2009; Hargadon and Bechky 2006). This upsurge in creativity management arises from a common belief that novel knowledge and creativity are prime assets within an organization (e.g. Van de Ven 1986; Shalley 1995; Amabile et al. 1995; Grant 1996; Oldham and Cummings 1996; Raudeliūnienė et al. 2012).

Along with this emerging trend, research streams on creativity have been developed at two levels of analysis: the individual level (e.g. Tesluk et al. 1997; Taggar 2002; Egan 2005; Perry-Smith 2006; Hirst et al. 2009; Shin et al. 2012; Venkataramani et al. 2013; Carmeli and Paulus 2014) and the firm level (e.g. Amabile 1998; Tesluk et al. 1997; Martins and Terblanche 2003; Shalley and Gilson 2004; Zhou and Shalley 2008; Puccio and Cabra 2010; Camelo-Ordaz et al. 2012; Mihalache et al. 2012; Yang and Wang 2014; Yuan et al. 2014). Research on individual-level creativity focuses on creativity of individual members of firms or teams and on how to make people creative. Although studies written from this person-centered approach offer some important findings about personal traits, backgrounds, and work styles of creative people in an organization, they have major limitations in that they ignore the role of the social environment and organizational systems in creativity and innovation (Amabile 1998).

On the other hand, studies on firm-level creativity emphasize organizational creativity, which is generally defined as the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system (Woodman et al. 1993). From this viewpoint, the concept of organizational creativity includes that which sparks the generation and production of ideas and alternatives. Organization-level research underlines the role of social environments, systems, and processes in inducing individual creativity and their importance to the creative performance of a team or an organization. Major findings from this research stream include the following: the innovative or financial performance of a firm results from the successful implementation of creative ideas within the organization and reaffirms the importance of creativity management for practitioners.

Most academic research on creativity management has highlighted the effects on organizational creativity of contextual or situational factors such as organizational culture, structure, or climate (Cummings and O'Connell 1978; Amabile 1988, 1996; Woodman and Schoenfeldt 1989, 1990; Woodman et al. 1993; Johnson 1996; Judge et al. 1997; Tesluk et al. 1997; Tushman and O'Reilly 1997; Martins and Terblanche 2003; Shalley and Gilson 2004; Hunter et al. 2007). Along this line, an increasing number of scholars have studied the role of group-level managers (Oldham and Cummings 1996; Drazin et al. 1999; Mumford 2000; Shalley et al. 2000; Mumford et al. 2002) or top-level managers (Camelo-Ordaz et al. 2012) in fostering

organizational creativity who are considered to form such contextual or situational aspects of their organizations. However, these studies share a common focus on a single individual's impact, failing to evaluate the effect of a manager group or a top management team as a whole. Although Yuan et al. (2014) pay attention to the relationship between top level managers and their firm's innovativeness, they only focus on the effect of functional backgrounds of the managers among their various characteristics. Also, the secondary data used in their study to measure the firm's innovativeness still focus on organizational resources and capabilities to develop new ideas, products and services, loosely connected to the environmental factors such as organizational structure, climate, or culture.

The objective of this paper is to shed more light on the antecedents of organizational creativity by focusing on the role of organizational leaders, that is, the top management team (TMT) and its importance to organizational culture, structure, and climate. Specifically, we investigate the characteristics of TMT as determinants of organizational creativity, drawing upon the upper-echelon perspective. Also, the organizational creativity index (OCI), which was developed for use in assessing the creativity of major companies in Korea, is used as a proxy for organizational creativity in our study. This study contributes to organizational creativity research in two ways.

First, we link studies on organizational creativity with those written from the upper echelon perspective, elucidating the relations between TMT characteristics such as size, average age, or experience diversity and organizational creativity. The upper-echelon perspective, initiated by Hambrick and Mason (1984), suggests that the TMT plays a key role in forming internal social environments (e.g. organizational culture and climate) by offering visions of and setting goals for the organization. The TMT is also responsible for establishing internal rules and procedures. Common sense dictates that these characteristics must affect various aspects of an organization, including its creativity. Top management exerts a critical influence on internal environmental conditions within an organization, such as its culture, structure, and climate, all of which are commonly accepted as antecedents of organizational creativity in the existing literature. Surprisingly, however, few studies have investigated the antecedents of organizational creativity, such as the characteristics of top managers. Although some recent research connects TMT characteristics/vision consensus to organizational innovation, learning, or performance (e.g. Mihalache et al. 2012; Heyden et al. 2013; Yang and Wang 2014), creativity is a different concept from innovation or learning. Amabile (1998) viewed creativity as a requisite for innovation. She defined organizational creativity as a concept including resources (creative people) and capability (process, system, structure) for innovation. In this study, we show the importance of the TMT for organizational creativity, underscoring the value of considering TMT characteristics in creativity management.

Second, we use a more direct and precise variable for organizational creativity based on a clear definition provided in extant research (e.g. Woodman et al. 1993; Amabile 1998). Many existing studies have operationalized organizational creativity as the simple sum of individual creativities within the organization (Ford and Kleiner 1987; Agrell and Gustafson 1994; Oldham and Cummings 1996). To avoid

the common mistake of making this assumption, an organizational creativity index was used as a dependent variable to capture creativity at the organizational level. This index was developed jointly by the *Maeil Business Newspaper*, South Korea's main daily business newspaper, and *A.T. Kearney Korea*, a global management consulting firm. The index was created based on Amabile's KEYS framework, which was originally developed to assess work environments in terms of organizational creativity (Amabile et al. 1995).

The results have several important conceptual and practical implications. First, this study increases our understanding of the relationship between TMT characteristics and organizational creativity by introducing TMT characteristics as antecedents to the factors influencing organizational creativity. Fruitful avenues for further research of this important yet understudied topic are suggested, and useful managerial tools are provided for composition of an adequate board.

The paper is organized as follows. First, existing studies on organizational creativity and TMT are briefly reviewed. Hypotheses regarding TMT characteristics and organizational creativity are then developed. The empirical setting, methods, and statistical results are presented. Finally, the implications of our findings are discussed in light of the extant literature.

2 Literature review

2.1 Definitions of and factors affecting organizational creativity

Organizational creativity is generally defined as the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system (Woodman et al. 1993). Various factors may foster or impede organizational creativity. According to Tushman and O'Reilly (1997), the basic elements of organizational culture (shared values, beliefs, and behaviors expected from members of an organization) influence creativity. In addition, organizational climate can influence both the level and frequency of creative behaviors (Amabile et al. 1995). Organizational climate includes such aspects as freedom (Bailyn 1988), risk-taking tendency (Kimberley and Evanisko 1981), and collaborative atmosphere (Monge et al. 1992). Organizational structure may also affect organizational creativity. For example, highly adaptive organizations tend to support multiple conditions under which organizational creativity may increase (Basadur 1992). Adaptive organizations continually change their routines to find better ways of doing things. Continuous adaptation to change requires flexibility and creativity. On the other hand, rigid adherence to rules tends to have a negative impact on creativity. Centralized decision-making and control also reduce information flow within an organization, which impedes creativity (Kimberley and Evanisko 1981).

2.2 Impact of the TMT on the organization: upper-echelons perspective

The upper echelons perspective began from the question of why organizations act as they do. Management research has a long tradition of emphasizing the role of top

managers in exploiting internal resources, adapting an organization to variable environments, and seeking strategic alternatives (e.g. Barnard 1938; Selznick 1957; Child 1972; Minzberg 1979). According to this view, an organization becomes a reflection of its top executives (Hambrick and Mason 1984). In addition, during times of environmental turbulence, in which an organization becomes more complex, a single top executive, such as a CEO, may have tremendous difficulty making important managerial decisions alone. In support of this notion, Hambrick (1994) argued that organizational outcomes are better understood by a TMT than by a single CEO.

The TMT can be considered as a decisional entity that is involved in forming an organization's competitive moves. Thus, the TMT plays an important role in shaping organizational characteristics by taking part in the firm's key decision-making processes (Hambrick et al. 1996). Previous researchers focusing on the upper-echelons perspective have found that the TMT influences various aspects of an organization, such as its culture, climate, structure, and knowledge base (Hambrick and Mason 1984; Nonaka 1991; Martins and Terblanche 2003; Tuulik and Alas 2003). For example, Martins and Terblanche (2003) suggested that when the values and actions of the TMT encourage free exchange of information, open questioning, support for change, and diversity of beliefs, the result is an organizational culture that supports creativity and innovation.

As explained above, creativity is neither performance nor an innovation, but the ability to innovate. As a result, creativity is influenced by the general characteristics of an organization, such as its climate, structure, and culture. Many studies on organizational creativity have focused on cultural or structural elements of organizations as decisive factors of their creativity (Amabile 1998; Amabile et al. 1996; Martins and Terblanche 2003; Hunter et al. 2007; Lin and Liu 2012). These organizational characteristics are largely determined by organizational leaders. Thus, our research focuses on the relationship between top managers and organizational environments. In this respect, we believe that the upper echelons perspective is a more appropriate theoretical basis for this study compared with other theories such as the resource-based view. Drawing on other studies written from this perspective, we examine the relationship between top managers and organizational creativity.

3 Theory and hypotheses

In this section, theoretical arguments are developed about the relationship between TMT characteristics and organizational creativity. Hypotheses regarding the relationships between these two constructs are then suggested.

3.1 TMT characteristics and organizational creativity

A TMT consists of individuals with the authority and power to make decisions for a specific purpose, such as internal resource allocation, middle-manager staffing, and project planning. According to Westley and Mintzberg (1989), the TMT creates

strategic vision, communicates it throughout the organization, and encourages employees to realize that vision. Throughout this process, the TMT may either enhance or undermine the development of organizational creativity by shaping specific internal environmental conditions for achieving strategic goals. Thus, we suggest that TMT characteristics influence the conditions under which organizational creativity is developed. For instance, TMT characteristics such as size or average age can influence the organizational climate or culture for creativity (Kimberley and Evanisko 1981; Monge et al. 1992; Amabile et al. 1995) because those traits are closely related to the cultural norms involved in decision-making. TMT size and age also affect the strategic vision and direction of an organization, and the extent to which it offers creative solutions. TMT characteristics also influence an organization's structure (Kimberley and Evanisko 1981; Basadur 1992), since TMTs tend to structure organizations in accordance with their strategic vision and direction.

Research written from a TMT homogeneity–heterogeneity perspective (Ahuja et al. 2008; Bantel and Jackson 1989) has shown that TMT diversity influences firm performance (e.g. Carpenter et al. 2004; Nielsen 2010). A core argument in this research stream is that greater TMT diversity in terms of age, educational background, and expertise (rather than similarity) is likely to ensure variety in terms of sources of knowledge and information. This variety facilitates a more thorough analysis of data from different angles, which should lead to development of a large number of novel ideas (Hambrick et al. 1996; Milliken and Martins 1996). According to Hambrick and Finkelstein (1987), a heterogeneous TMT develops greater problem-solving skills in order to accommodate its various perspectives, which in turn improves innovativeness. Bantel and Jackson (1989) also found that TMT diversity enables firms to initiate more innovative strategies, as creative thinking is an outcome of overcoming differences. In addition, diversity may also encourage creative destruction by breaking down rigid assumptions and rules. Creative destruction is a critical prerequisite for innovation and creative construction (Auh and Menguc 2005). Hence, it is highly probable that TMT diversity may affect an organization's orientation towards creativity by enhancing employees' creative thinking and becoming the basis of organizational creativity.

3.2 Hypotheses

In this section, hypotheses are developed regarding the relationship between TMT characteristics and organizational creativity, and the relevant variables are identified and described.

3.2.1 TMT size

Existing studies have presented mixed results on the impact of TMT size on organizations. Some research on the role of the TMT as an organizational resource has demonstrated a positive relationship between TMT size and organizational outcomes such as innovation or financial performance. For instance, Sanders and Carpenter (1998) concluded that TMT size reflected a team's collective capacity to

gather and process complex information. They found a positive relationship between TMT size and expansive global strategies. Regarding TMT as an entity to promote organizational culture and climate for creativity, however, there are also some disadvantages associated with large TMTs that may outweigh the proposed benefits.

Larger TMTs may be strongly associated with inertia (Hannan and Freeman 1984) and a general tendency to stick to the status quo. TMTs with inertia problems may be reluctant to set challenging goals for their organizations or to introduce a flexible and horizontal organizational structure allowing a considerable degree of freedom or autonomy to junior employees. Several researchers have suggested that creativity is fostered by allowing a considerable degree of freedom or autonomy in the conduct of one's work (Amabile and Gryskiewicz 1987; Andrews and Farris 1972; Ekvall and Arvonen 1983). Some research has emphasized the importance of appropriately matching individuals to work assignments on the basis of both skills and interests in order to maximize the positive challenge of the work (Amabile and Gryskiewicz 1987). Several aspects of project supervision appear to be important, including the ability to set project goals clearly while allowing procedural autonomy (Amabile and Gryskiewicz 1987; Bailyn 1985). Larger TMTs with high inertia could impede organizational creativity by preventing the organization from establishing an adaptable structure and setting challenging goals.

Moreover, possible inertia and conflicts in large TMTs slow down decision-making. The speed of decision making in TMTs can promote or inhibit organizational creativity. Cultural norms related to the decision-making speed of organizations are easily formed (Tushman and O'Reilly 1997). Cultural norms that slow down decision-making in organizations impede organizational creativity.

In addition, when TMTs increase in size, opportunities for interaction and reciprocity among team members decrease (Zenger and Lawrence 1989; Thornburg 1991). The quantity and quality of communication among team members also diminishes (Zenger and Lawrence 1989). As a result, the organization experiences a decline in the quantity and quality of the information exchanged. With insufficient, poor-quality information and an inability or unwillingness of team members to express their points of view, TMT members are unable to promote creative thoughts or solutions. Lack of creativity in TMTs will negatively influence organizational creativity because they are incapable of introducing a challenging vision or creative organizational culture to organizations.

Accordingly, organizations with large TMTs are not likely to have favorable environments for creativity because employees in these organizations may have become inured to the stagnant organizational climate and reluctant to change. Hence, we put forth the following hypothesis:

Hypothesis 1 The size of the TMT is negatively related to organizational creativity.

3.2.2 Average age of TMT members

Previous research indicates that the average age of TMT members influences the degree to which they are oriented toward risk during strategic decision-making (Hambrick and Mason 1984; Hitt and Tyler 1991). Older managers possess less physical and mental stamina (Child 1974), have greater psychological commitment to the organizational status quo, and see financial and career security as their primary goals (Hambrick and Mason 1984). Therefore, older executives generally tend to engage in less risk-taking (Vroom and Pahl 1971).

Numerous studies have pointed out that creative thinking skills of firm members are affected by the organizational atmosphere or culture of orientation toward risk-taking, tolerance for ambiguity, perseverance in the face of frustration, and a relative unconcern for social approval (Amabile 1996; Feldman 1980; Golann 1963; Stein 1974). These environmental components constitute the basic orientation of the organization toward innovation. They also reflect the amount of support for creativity and innovation throughout the organization. The orientation toward creativity comes primarily from the highest levels of management.

Unlike older managers, youthful managers tend to make risky and unprecedented decisions (Hambrick and Mason 1984; Boeker 1988; Wiersema and Bantel 1992). Thus, firms with younger TMT members (on average) will be more inclined to pursue risk-taking strategies than firms with more mature TMT members. On the assumption that creativity is enhanced in an environment where risk-taking is encouraged and supported (Amabile 1988; Sternberg et al. 1997), we suggest the following hypothesis:

Hypothesis 2 The average age of the TMT is negatively related to organizational creativity.

3.2.3 TMT diversity

TMT members with diverse age groups, expertise, or educational backgrounds show knowledge or cognitive heterogeneity (Pelled 1996; Jehn et al. 1999; Bunderson and Sutcliffe 2002; Beckman 2006; Lee and Park 2006). TMT members' knowledge and cognitive diversity is especially important for determining their attention patterns, strategic persistence, and reorientation (Cho and Hambrick 2006).

When TMT knowledge or cognitive diversity is low, TMT members are more likely to think alike and have shared frames of reference and similar problem-solving heuristics (Bantel and Jackson 1989; Hambrick et al. 1996). Top managers with common knowledge or shared cognitive bases often have analogous interpretations of problems or given data. They may also have difficulties in deriving new solutions or ideas which depart radically from the TMT's collective prior knowledge. Thus, a less diverse TMT may be associated with organizational inertia and difficulty establishing the adaptable and flexible atmosphere necessary to promote creativity in organizations.

Greater TMT diversity should have a contrasting effect on organizational creativity. TMT diversity implies that senior executives can draw on various

knowledge and problem-solving approaches. In an organization with high TMT diversity, the atmosphere is likely to be more conducive to generating a broader set of data interpretations and novel ideas than with a less diverse TMT. Diverse and novel ideas (Bantel and Jackson 1989) may also encourage creative destruction, which is the breaking down of rigid assumptions and rules. Thus, TMT diversity may affect an organization's orientation towards creativity by enhancing employees' creative thinking, which is the basis of organizational creativity. Therefore, TMT diversity drives organizational creativity, and knowledge and cognitive diversity of top managers reduces the risk of strategic inertia in the organization and helps people to overcome pressure to conform (Lant and Milliken 1992; Wiersema and Bantel 1992).

TMT diversity may be classified into two broad categories (Pelled 1996; Harrison et al. 1998): visible and job-related diversity. Age diversity belongs to the visible dimension, while functional diversity and educational background diversity are associated with the job-related dimension. The impact of both dimensions of TMT diversity on organizational creativity is investigated in this study.

First, heterogeneity in age of the TMT increases diversity in perspective and breadth of information (Wiersema and Bantel 1992; Williams and O'Reilly 1998; Richard and Shelor 2002), which is important to organizational creativity. Age diversity may also nurture variety in attitudes and values (Tihanyi et al. 2000). Diversity of attitudes and values facilitates group creativity (Bantel and Jackson 1989). Hence, we hypothesize that:

Hypothesis 3a Age diversity in the TMT is positively related to organizational creativity.

Second, a TMT with functional diversity can take advantage of a range of special expertise (e.g. marketing, finance, human resource management) brought to the table by each TMT member. Managers with different functional expertise may hold different types and levels of knowledge, take different viewpoints, and manifest different attitudes (Hambrick and Mason 1984; Bantel and Jackson 1989). Also, functional diversity can promote group discussion and open disagreement, which leads to more creative solutions (Lant and Milliken 1992; Hambrick et al. 1996). Occasionally, creative abrasion fosters organizational creativity (Leonard and Straus 1997). Open disagreement caused by TMT functional diversity may require unique problem-solving skills and diverse solutions, which has a positive effect on organizational creativity (Milliken and Martins 1996; Pelled 1996; Leonard and Straus 1997).

Hypothesis 3b Functional diversity in the TMT is positively related to organizational creativity.

Finally, educational background is an indicator of an individual's knowledge and skills (Hambrick and Mason 1984; Melnikas 2005). Heterogeneity in the educational background of the members of a TMT may lead to variety in perspective and information sources (Bantel 1993) and provide TMT members with the bases of diverse cognitive structures and mental maps (Wiersema and Bantel 1992; Bantel 1993; Milliken and Martins 1996; Tihanyi et al. 2000). Therefore,

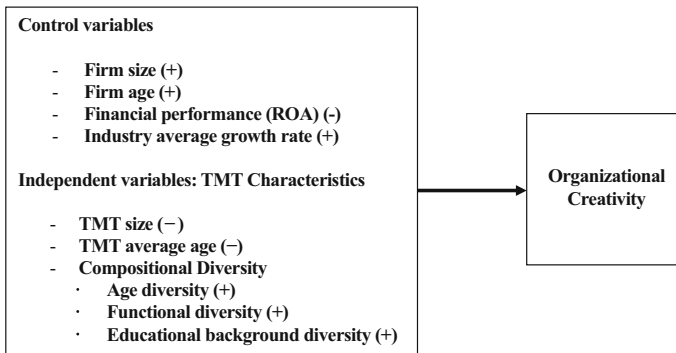


Fig. 1 Research model

TMT educational background diversity may facilitate the conditions under which organizational creativity can be developed. On the other hand, homogeneity in the educational background of TMT members often leads to similarity in information processing and problem-solving. This similarity results from shared curriculum, training, and experience; too much similarity undermines organizational creativity. Hence, we hypothesize that:

Hypothesis 3c Educational background diversity in the TMT is positively related to organizational creativity.

Figure 1 shows our research model that integrates all the hypothesis.

4 Methods

4.1 Sample

The empirical data set in this study is based on a broad range of surveys conducted jointly by the *Maeil Business Newspaper* and A.T. Kearney Korea in 2004 as well as secondary data from various sources. The survey was designed to develop the organizational creativity index (OCI) for use in assessing the creativity of major companies in Korea. The *Maeil Business Newspaper* is Korea's leading business daily newspaper, with a circulation of 920,000 issues (ABC certified number). The newspaper's power and prestige in Korea's business community has encouraged active participation from major corporations. A.T. Kearney is a reputable global consulting company that uses its expertise to design systematic and robust survey instruments.

An extensive surveys of leading Korean firms from various industries increased the overall external validity of the results of this study. The sampling procedure was as follows. Representative industries in Korea were selected, including petrochemicals, construction, financial services, electronics, automobile manufacturing, retail, food and beverage production, telecommunications, biotechnology, and software. Selected industries satisfied one of the following three conditions: high growth

potential, strong global competitiveness, or major impact on the national economy. In the next step, approximately five leading firms in each industry were selected on the basis of sales volume. Through a rigorous sampling procedure, the *Maeil Business Newspaper* and A.T. Kearney Korea chose 47 leading Korean firms for measurement of organization-level creativity. About 1500 employees of these firms participated in the survey. This sample was utilized in this study. Data on the independent variables are secondary data collected from the business reports of each enterprise, yearbooks, and the internet in the year previous to the time the OCI was measured.

4.2 Measurements

In order to measure TMT diversity, the scope of TMT must be defined. Following other upper echelons studies (Michel and Hambrick 1992; Wiersema and Bantel 1992; Cannella and Hambrick 1993; Finkelstein and Hambrick 1996), the TMT was defined in this study as the group of chief executive officers of a firm, including all officers above the level of vice president and any other officers on the board of directors.

4.2.1 Dependent variables

To test hypotheses 1 through 3, the OCI was used as the dependent variable. Based on Amabile's KEYS framework, which was designed to assess organizational creativity in the work environment or the perceived work environment for creativity (Amabile et al. 1995), the OCI was developed jointly by the *Maeil Business Newspaper* and A.T. Kearney Korea.

KEYS is an organizational survey that assesses the climate for creativity and innovation that exists in organization by measuring the work environment, such as the management practices, resources, motivations and interactions. The survey was intended to serve as a tool for research and theory development, particularly for scholars interested in understanding contextual influences on creative behavior in organizations. It was demonstrated that the tool has acceptable reliability and validity in peer-reviewed literature (Mathisen and Einarsen 2004). Recently, an increasing number of studies on organizational creativity have been focusing on the application of KEYS to non-western societies (Hsu and Fan 2010). Moreover, a study developed a Taiwan version of KEYS by translating it in order to understand the feasibility of using KEYS to assess the organizational climate for creativity in Taiwanese organizations (Lin and Liu 2012). Meanwhile, the application methods of KEYS in literatures on creativity vary depending on research environments or settings. Some researchers measured a creative climate in organizations using abbreviated versions of the instrument KEYS (Verbeke et al. 2008; Hsu and Fan 2010; Rosello and Tran 2012). The abbreviated versions are composed of only 24 items or 26 items, reduced from original 78 items according to componential parameters (Amabile et al. 1996). Others synthesized theories including Amabile's work to develop an integrated version of creativity index for organization (McLean 2005).

Following the recent research stream, we used OCI which was designed to measure a creative climate in Korean firms in this study. The index includes 36 measurement items. Table 1 shows the measurement items for OCI.

Table 1 Measurement items for OCI (organizational creativity index)

Aspiration for creative output	Creative work skills
1. Job satisfaction	1. Leadership
Adequate job assignment	Excellent role model
Adequate task allocation	Clear task allocation
Importance of task	Time to spare
2. Reward system	Communication
Share of direct reward system	Openness
Share of indirect reward system	Trust to employee
Fairness of direct reward system	Support of creative action
Tolerance for failure	2. Communication
3. Entrepreneurial mindset	Open attitude
Emphasis on creativity	Encouragement of idea collision
Share of entrepreneurial mind	Fairness of idea evaluation
Organizational knowledge	Internal communication channel
1. Knowledge management system	Informal communication channel
Possession of excellent contents	3. Creativity embodiment system
Convenience of use	Usage
Frequency of use	Utility
External knowledge resource process	Organization
Infrastructure enabler	4. Organization structure
1. Cultural aspects	Rigidity of hierarchy
Changeability	Rigidity of top managers
Diversity	Flexibility of horizontal organization
Exchange of opinion	5. Way of doing things
Recognition of creativity	Autonomy
	Time to spare
	Rejection to quantitative evaluation
	Education and training for creativity
	6. Teamwork
	Diversity of members
	A sense of duty
	Trust and cooperation
	Internal competition
	7. Physical space
	Personal space
	Formal space for social interaction
	Informal space for social interaction

The measurement items were developed based on dimensions, definitions of factors, and sample items of KEYS offered by the center for creative leadership (CCL), the original publisher of KEYS so that OCI captures all of the characteristics of work environment measured by KEYS: encouragement of the organization, encouragement of the hierarchy, support of the group, sufficient resources, challenges, autonomy with work, pressure and organizational obstacles. In order to validate these items, the two developers of the OCI conducted an intensive literature review and focus group interviews with industry experts. Also, a four-point Likert scale was used, which is same scale as KEYS.

4.2.2 Independent variables

4.2.2.1 Size of TMT The number of TMT members was used in this study as a proxy variable for the size of the TMT, which was a common measure in the existing studies (e.g. Bantel and Jackson 1989; Sanders and Carpenter 1998).

4.2.2.2 Average age of TMT The average age of the TMT was calculated by dividing the sum of the ages of all TMT members by the number of TMT members.

4.2.2.3 Age diversity in TMT As a continuous variable, TMT age diversity was calculated as the coefficient of variation (Allison 1978). The coefficient of variation is acquired by dividing the standard deviation of the ages of TMT members by the mean values of the ages of TMT members. A high coefficient of variation indicates increased heterogeneity in terms of age.

4.2.2.4 Functional diversity in TMT In order to measure TMT functional diversity, the special expertise of each TMT member was classified into the following categories: general management, marketing, law, production, human resource management/industrial relations, research and development, accounting/finance, and others (Michel and Hambrick 1992). Then, functional diversity was measured as a variation of the Blau index, as follows:

$$H_F = 1 - \sum S_i^2$$

where H is the heterogeneity measure and S is the percentage of TMT members in each of the eight special expertise categories.

4.2.2.5 Educational background diversity in TMT Following Wiersema and Bantel (1992), each TMT member was categorized into one of the following major academic fields based on their educational backgrounds: pure science, engineering, business/economics, law, and liberal arts. Then, educational background diversity was measured in terms of variations of the Blau index, as follows:

$$H_E = 1 - \sum S_i^2$$

where H is the heterogeneity measure and S is the percentage of TMT members in each of five major academic fields.

4.2.3 Control variables

Additional factors (e.g. firm size) may also influence organizational creativity. Existing studies have shown that large firms generally benefit from a broad range of knowledge and abundant organizational resources, which may foster organizational creativity (Cook 1998; Nystrom et al. 2002; Hunter et al. 2007). Firm size is often measured based on the number of employees. To satisfy the assumption of normal distribution, the natural log of the number of employees is used in this study. Firm age is also investigated. On the one hand, an older firm has had time to acquire more information, resources, and experience, and to establish strong relationships among members of the organization, which increases the achievement of creative tasks (Woodman et al. 1993). On the other hand, an older firm is more likely to suffer from organizational inertia. In this study, firm age is measured as each firm's total number of operational business years. In addition, financial performance is closely related to both environmental conditions and motivation for organizational creativity. Scholars have proposed that the information provided by affective states can influence an organization's effort and persistence for promoting creative activities at work (Hirt et al. 1997; George and Zhou 2002). Such studies have implied that when an organization's performance is good, employees will interpret their positive mood as an indication that they have met their creative goal and no additional effort is needed. Thus, under positive conditions, organizations tend to maintain the status quo, thereby diminishing the need and motivation for change, which in turn reduces organizational creativity. In this study, return-on-assets (ROA) in the previous fiscal year is included as a proxy for financial performance. Industry effects may also exist. For instance, highly hostile environments, such as turbulence in an industry, production pressure, or keen competition, can establish a need for innovation and cause environment to become a more important influence on creative achievement (Borrill et al. 2000; Russell and Russell 2002; Janssen et al. 2004). To control for industry effects, the average growth rate of each industry in our data set is included in the statistical model. In highly expanding industries, the pressure to innovate is predicted to be relatively low. Table 2 summarizes the operational definitions of the variables used in this study.

To test our hypotheses, an ordinary least squares method was employed. In order to guarantee the causal relationships among variables, the dataset was constructed so that explanatory variables preceded the dependent variable with a 1-year time lag.

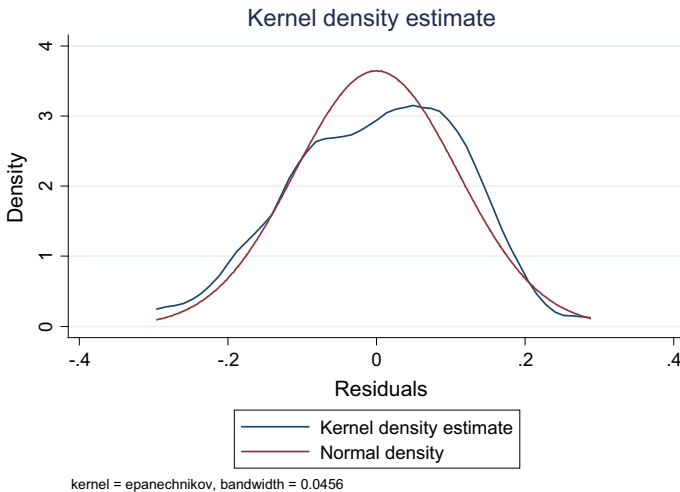
As a normality test for our sample, we conducted Shapiro–Wilk (SW) W-test to check normality of residuals. In statistics, the SW test tests the null hypothesis that the population is normally distributed (Shapiro and Wilk 1965). If the p value is greater than the chosen alpha level, one does not reject the null hypothesis. Our data set with a p value of 0.48 does not result in rejection of the null hypothesis for an alpha level of 0.05, indicating that the data came from a normally distributed population. Table 3 shows normal distribution of residuals of our model.

Table 2 Descriptions of variables

Variable	Description
Organizational creativity	OCI (organizational creativity index) developed jointly by <i>Maeil Business Newspaper</i> and <i>A.T. Kearney Korea</i> based on Amabile's KEYS
TMT size	Total number of TMT members
TMT average age	Average age of all TMT members
Age diversity in TMT	Coefficient of variation of TMT members' ages
Functional diversity in TMT	Variation of the Blau index: $H_F = 1 - \sum S_i^2$, where H is the heterogeneity measure and S the percentage of TMT members in each of eight special expertise categories
Educational background diversity in TMT	Variation of the Blau index $H_E = 1 - \sum S_i^2$, where H is the heterogeneity measure and S the percentage of TMT members in each of five academic major fields
Firm size	Total number of employees
Firm age	Total number of business years of each firm
ROA	ROA in the previous fiscal year
Industry growth rate	Average growth rate of each industry

Table 3 Shapiro–Wilk W test for normal data

Variables	W:normal	p
r (N = 47)	0.9772	0.4802



5 Results

Table 4 lists the means, standard deviations, and correlations among the variables in the statistical model.

Table 5 presents the results of the regression analysis. The base model only includes the control variables. The full model includes the independent variables, and the adjusted R^2 value considerably increases (from -0.04 to 0.35). The adjusted R^2 value compares the explanatory power or goodness-of-fit of regression models that contain different numbers of predictors. A higher adjusted R^2 value of the full model indicates that the independent variables improve the model's explanatory power.

The regression results show that TMT size, average age of TMT, and TMT functional diversity were associated with organizational creativity. These results supported Hypothesis 1, which suggested a negative impact of larger TMTs on organizational creativity. Hypothesis 2 was also strongly supported; it suggested that organizations with a higher average age of TMT members were less creative compared to organizations with a lower average age of TMT members.

Among the three dimensions of compositional diversity, only TMT functional diversity had a significantly positive impact on organizational creativity, supporting Hypothesis 3b. TMT age diversity had a positive effect on organizational creativity, as expected, but this effect was not significant. The effect of TMT educational background diversity on organizational creativity was also not significant.

In the analysis of control variables, ROA in the previous fiscal year had a significantly negative effect on organizational creativity. Good performance may have diminished motivation or need for change, which is closely related to creativity. Other control variables had no significant impact on organizational creativity.

6 Conclusions and discussion

The statistical findings of this study demonstrated that TMT characteristics had an important influence on organizational creativity. These results offer some conceptual and practical implications about the relationship between TMT characteristics and organizational creativity.

According to the results presented here the disadvantages related to a large TMT outweigh the benefits in terms of fostering organizational creativity. Structural inertia, increased cognitive and emotional conflict among TMT members, longer decision-making time, and decreased opportunities for interaction among members may contribute to this decline. Thus, to promote organizational creativity, the size of the TMT should be carefully considered. Such firms must develop mechanisms to increase interaction among TMT members and compositional diversity in order to reduce the risks of high organizational inertia and thus promote creativity.

The results of our research indicate that higher average age of a TMT has negative effects on organizational creativity. This effect may be attributable to

Table 4 Correlations (N = 47)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1. Organizational creativity	3.07	0.15	-								
2. Industry average growth rate	12.00	9.67	-0.044	-							
3. 2004 ROA	7.09	7.13	-0.191	0.235	-						
4. Firm size (no. of employees)	8242.04	10,933.74	0.033	-0.198	0.111	-					
5. Firm age (no. of biz years)	34.94	21.92	0.121	-0.025	-0.114	0.162	-				
6. TMT size	54.51	54.02	-0.004	-0.124	-0.055	0.612***	0.161	-			
7. Average age of TMT	52.13	3.87	-0.294**	0.040	-0.175	0.000	0.323***	-0.137	-		
8. TMT age diversity	0.10	0.03	0.038	0.302**	0.127	-0.295**	-0.144	-0.140	-0.261*	-	
9. TMT background diversity	0.70	0.17	0.107	0.328**	-0.082	-0.085	0.077	0.110	0.041	0.190	-
10. TMT functional diversity	0.66	0.16	0.532***	-0.111	-0.009	0.101	0.065	0.233	-0.155	-0.070	0.247*

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 5 Regression Results

Variables	Base model	Full model
<i>Control variables</i>		
Industry average growth rate	0.0002 (0.949)	0.0017 (0.441)
2004 ROA	-0.0040 (0.245)	-0.0064 (0.026)**
Firm size	5.5900 (0.800)	2.9700 (0.197)
Firm age	0.0006 (0.547)	0.0014 (0.130)
<i>TMT characteristics</i>		
TMT size		-0.0009 (0.044)**
Average age of TMT		-0.0144 (0.011)**
TMT age diversity		0.1651 (0.783)
TMT functional diversity		0.5067 (0.000)***
TMT educational background diversity		-0.0351 (0.776)
No. of observations	47	47
<i>F</i>	0.53	3.76***
Adjusted <i>R</i> ²	-0.04	0.35

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

structural inertia, risk aversion, adherence to the status quo, and pursuit of financial and career security among older TMT members. Therefore, a firm must include younger executives on the TMT in order to promote organizational creativity.

In addition to TMT size and average age, TMT functional diversity had a significant effect on organizational creativity. Three dimensions of TMT diversity were examined in this study: age, function, and educational background diversity. Only TMT functional diversity had a significant and positive effect on organizational creativity. Our results indicate that hiring TMT members with diverse functional experience enhances creativity by enabling a firm to exploit a variety of knowledge sources and different viewpoints.

In conclusion, the findings of this study suggested that TMT characteristics must be considered for firms that desire to improve organizational creativity. In this paper, the relationship between TMT characteristics and organizational creativity was elucidated. Many previous studies have shown that TMT characteristics have critical effects on organizational outcomes and contextual factors such as firm culture, climate, and knowledge base. In addition, many scholars have studied the social and contextual factors that influence organizational creativity. However, few studies have examined the direct relationship between TMT characteristics and organizational creativity, as most of existing studies are concerned with a single individual manager's impact on organizational creativity. A few papers that examined the relationship between TMT characteristics and organizational creativity did not successfully address top managers' various characteristics other than their business-related abilities or backgrounds.

To overcome such problems in existing studies, in this study, we empirically tested the relationship between the TMT characteristics and organizational

creativity using the organizational creativity index. The results showed that TMT characteristics influence organizational creativity. Useful advice for managers regarding optimal board composition was also provided to increase organizational creativity. This advice involved evaluation of three dimensions of TMT diversity.

In this study, TMT characteristics are viewed as antecedents of organizational features that influence organizational creativity. Future research may identify other organizational or environmental factors that enhance or undermine organizational creativity. For example, firms' strategy types can impact organizational creativity. Firms that focus on technological innovation and make large investments in R&D activities are expected to have higher organizational creativity. As aforementioned, industry effects also may exist. Although we include only the industry growth rate as a control variable in our study, other environmental factors should be tested in future research.

In addition, moderating factors between TMT characteristics and organizational creativity may be at work. For instance, organizational structure or the learning process may also affect the relationship between TMT characteristics and organizational creativity. Organizational creativity may itself play a role in mediating or moderating the effect of TMT characteristics on firm performance. In terms of research methodology, increasing the number of sample firms for the OCI will certainly enhance applicability and reliability of the index if possible. With a larger sample, we can conduct structural equation modeling (SEM) of measurement items to understand feasibility of the index. Sub-samplings from a sizable data set also give researchers opportunities to broaden the scope of studies on organizational creativity by testing diverse hypotheses empirically. Future research may address issues above with a larger data set, shedding more light on organizational creativity and its importance in the business world.

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