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EFFECTS OF COMPLEMENTARITY TYPES UPON DEMAND-ABILITY TEAM-MEMBER FIT AND TEAM PERFORMANCE

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ABSTRACT

EFFECTS OF COMPLEMENTARITY TYPES UPON DEMAND-ABILITY TEAM-MEMBER FIT AND TEAM PERFORMANCE

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I propose that member diversities in function, role, and cognitive style exert complementary positive influence on team effectiveness via Demands-Abilities fit (D-A fit). I apply complex system approach as the predominant theoretical lens to integrate diversity and fit research. In addition, I address the need to consider boundary conditions of team member diversity effects. Specifically, team need for cognition and task routineness are expected to strengthen the positive effects of diversities on team D-A fit.

Using data from a total of 44 teams, I found role diversity had unique positive indirect effect on team performance via team D-A fit. In contrast to the expectation, cognitive diversity had negative indirect effect on team performance via team D-A fit. Although there was no significant main

effect of functional diversity, it showed positive effect on team D-A fit and team performance when team members enjoy deliberating (high team need for cognition). Moderation effects of team need for cognition and task routineness were generally supported. Functional and cognitive diversities were positively related to team D-A fit when team need for cognition was high. And functional and role diversities had positive effect on team D-A fit when task routineness was high. As opposed to expectation, however, role diversity was negatively related to team D-A fit when team need for cognition was high.

Keywords: diversity, demands-abilities fit, need for cognition, task routineness, team performance, complex adaptive system

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INTRODUCTION

Importance of Teams in the Organization

Understanding teams and individuals in them is very important these days, considering today's business world where rapid and far-reaching changes continue to occur. As needs for keeping up with rapid changes of environments ratchet up, organizational structures are shifting radically to the point in which individual managers and team members have far greater autonomy, responsibility and accountability (Humphrey, Hollenbeck, Meyer, & Ilgen, 2007). If future change is to occur in organizations, it will likely come through teams. That is because the potential for organizational learning, which is very essential for the today's companies (Nonaka & Toyama, 2003), comes from teams that change and adapt (Chan, et al., 2003).

As a consequence, building effective work teams is becoming more and more critical concern in business field nowadays and the issue of team-based variables has gotten much academic attention recently (Gibson, 2001; Gibson, Randel, & Earley, 2000; Gully, Incalcaterra, Joshi, & Beaubien, 2002; Hogg, 1992; Prussia & Kinicki, 1996; Seijts, Latham, & White, 2000). In short, as many researchers have noted (Hackman, 1987; Sproull & Kiesler, 1991), teams are inarguably very pervasive and arguably the most critical units of the organization these days in both practical and academic senses.

Then, what makes effective teams?

Human Resources in Teams

Human resources constitute core factor when it comes to building effective teams (Shea & Guzzo, 1987). Basically, teams bring multiple expertise, skills and resources to tasks that may be too large or complex for a single individual to undertake combining human resources from team members. However, as projects and teams grow in size and complexity, tasks become more numerous, diverse and complex (Espinosa, Lerch, & Kraut, 2004). In this case, unfortunately, effectiveness in teams cannot be achieved automatically by merely grouping people and making them work together. Rather, team should carefully place the right person in the right position. As Shea and Guzzo (1987) noted, utilizing human capabilities and talents that are appropriate for the given tasks is the very basic requirement for the effective work teams. In fact, the *Financial Times* in 2001 identified "the wrong mix of people" as the fundamental mistake in the building of teams. In the article, "The Tactics of Team Building," the *Financial Times* (Hunt, 2001) highlighted a critical question to address when composing a team: Are the skills required of the team available in the current membership?

Fit in Complex Teams

A concept that can be used in exploring the issue of "skills required by the team" is Demands-Abilities fit (D-A fit) concept. D-A fit has referred primarily to judgments of congruence between an employee's skills and the demands of a job (Kristof, 1996). Recognizing the importance of teams today, I mainly explore the antecedents of D-A fit in teams.

In most cases, D-A fit has been examined on a basis of individual attributes. Of course, team's general D-A fit level can be attained by aggregating individual member's D-A fit perception. At the same time, however, structural characteristics of the team can influence effectiveness of team's match with its members. This structural perspective is especially needed, considering the recent call that systematic perspectives are needed in management studies including team research (Amaral & Uzzi, 2007).

According to researchers, teams are complex adaptive systems (McGrath, Arrow, & Berdahl, 2000). In contrast to simple systems, such as the pendulum, which have a small number of well-understood components, or complicated systems, such as CPU of a computer, which have many components that follow predefined coordination rules (Perrow, 1999), complex systems have components that can autonomously interact through emergent rules (Amaral & Uzzi, 2007). Complex systems form whenever there are group of interacting agents as in the case of work teams (Amral & Uzzi, 2007). And such complex systems explore and test a variety of alternatives to survive and develop

(Beinhocker, 2007). In this sense, the increase in the attemptable alternatives can directly lead to the enhancement of team effectiveness (Bar-Yam, 2003).

My primary objective for this study is to understand whether, how, and when the diversity in work teams affects the general effectiveness of the team by increasing the scope of alternatives. Using complex adaptive system perspective as the predominant theoretical lens, I propose team D-A fit as the mediating mechanism between team member diversities (functional diversity, role diversity, and cognitive diversity) and team performance. In addition, I address team need for cognition and task routineness as the boundary conditions under which diversities can have positive effects on team D-A fit. I hope this study to contribute to the both of fit and diversity literature, applying complex dynamic perspective in team research.

Before articulating my hypotheses with details, I will review literature of D-A fit and address currently existing theoretical gaps and ambiguities first. Then, I expand the concept of D-A fit to the team level construct and draw on complex system approach to deepen the understanding on the mechanism in which D-A fit is successfully built in work teams.

THEORETICAL BACKGROUNDS

Demands-Abilities Fit

One research domain in organizational psychology that taps into the issue of effective utilization of human resources is D-A fit literature. D-A fit is a type of Person-Environment fit (P-E fit) concept. The fundamental tenet of P-E fit theories is that a desirable fit between the environment and an individual creates compatibilities that result in positive consequences for the individual and, consequently, the environment as a whole. There is a long history of research that studied fit within organizations, concentrating on the fit between individuals and the surrounding environment such as organization, vocation, job, and team (Kristof, 1996).

Under the theoretical umbrella of this P-E fit frame, D-A fit perspective suggests that fit builds when an individual has the abilities required by environments. Organizations and teams demand specific type of contributions from their employees in terms of time, effort, commitment, knowledge, skills, and abilities (Kristof, 1996). Then, D-A fit is achieved when employees supply appropriate human resources to meet these organizational demands. In this sense, D-A fit can serve as an index indicating the extent to which human talent are utilized effectively in the organization.

Extension of D-A Fit to Team Level

D-A fit along with other P-E fit concepts inherently falls under the domain of individual level constructs (Kristof, 1996). That is, conceptually, fit is framed as individual's egocentric relationship with environment; hence, D-A fit itself is set as a kind of individual attribute once the specific environments are given. However, I posit that D-A fit needs to be extended to cover team level as well and that team's fit with its entire members can be conceptualized exclusively at the team level without aggregation of D-A fit of an individual member and team. More specifically, I maintain that the referent of D-A fit assessment can be overall team members or team as a whole (e.g. *our team members'* knowledge, skill, and abilities make good fit with the requirement of *our team members'* job) instead of individual member (e.g. *my* <*his/her*> knowledge, skill, and abilities make good fit with the requirement of *my* <*his/her*> job). This requires the conceptual expansion of fit concept from fit between individual person and environment to fit between general entity (who is not necessarily single human being and can be collective or institution) and environment.

Then, two questions should be answered. First, is such expansion theoretically acceptable? Second, does it offer any incremental benefit theoretically or practically, compared to individual D-A fit?

The notion of fit refers to compatibility of two entities. And, in one sense, the team makes a lasting entity that lives beyond specific members. While individual team

members come and go, teams or departments as structure or institution maintain their presence in the organization with idiosyncratic characteristics continuously revitalized by climate and routine. On the other hand, group of members also constitutes a collective entity that has distinct value beyond individual members. Specifically, squad of individuals comes to have emergent characteristics that cannot be reduced to each individual (Checkland, 1999). The whole is more than the sum of its parts. That is, team members as a collective are a substantial being somewhat independent of its members. Thus, the relationship between team as an entity and squad of team members as a collective has unique meaning beyond mere average or aggregation of individual relationships between each member and team as a whole. In this light, fit between team as structure or institution and squad or group of team members can be conceptualized.

Considerations on conceptual validity apart, however, team level D-A fit offers additional value from the theoretical and practical points of view as well. That is, examining team level D-A fit offers deeper understanding of team effectiveness let alone the above-discussed point that team level D-A fit does not violate conceptual assumptions of fit concepts. Team needs appropriate workforce to effectively accomplish given tasks. When these needs are met by its members, it can be said that demands of team fit abilities of team members. However, these matches do not occur automatically even if appropriate talents exist within the team. In economics, mere coexistence of demand and supply does not guarantee transaction, or creation of value. Other mechanisms for the transaction such as markets or hierarchical organizations are needed.

Similarly, fit between team tasks (demands) and human resources of team members (supplies) will be influenced by how effectively tasks were distributed and designed within the team. Even when a workforce possessing demanded capability exists in the team, demands of the team cannot be satisfied unless the focal task is assigned to the appropriate workforce. The problem is these team-level processes such as work distribution and team coordination can hardly be detected at the individual level analysis. As noted above, team has emergent features. Team members can perform their individual responsibilities competently, but still be as much uncoordinated with the rest of the team, and consequently ineffective in light of team performance, if the dependencies among them and their sub-tasks are not properly managed (Espinosa et al., 2004). In other words, it is possible that individual D-A fit does not represent the team reality or team effectiveness, although D-A fit should offer some utility to the team as beneficiary by definition. In this sense, even when individual level index has quite validity, it is possible that the index does not represent the reality of the team as a whole sufficiently. This is exactly applied to the case of D-A fit. As a matter of facts, prior research presented some shortcomings of single person-team D-A fit, regarding its predictive power with effectiveness measures. For example, Lauver and Kristof-Brown (2001) found no relationship between individual D-A fit and job performance. And in a study by Cable and DeRue (2002), individual D-A fit perceptions did not predict any of the individual outcomes they hypothesized, including occupational commitment, job performance, and pay raise. Of course, it is plausible that those null results were derived because D-A fit

was measured via perceptions, which are notoriously susceptible to cognitive biases. However, although it is true that a person's perceptions of abilities can be imperfect and skewed (generally upward for him or herself and downward for others), research indicates that individuals can provide largely accurate reports of capability levels considering given tasks (Atwater, Ostroff, Yammarino, & Fleenor, 1998). Rather, null effects might imply that individual D-A fit is not enough to explain variance of team effectiveness. According to team coordination literature, fit between members and assigned tasks are largely determined by task process or task design of the team (Espinosa et al, 2004). In this regard, I posit that only when it covers fit between team and collective of overall team members, D-A fit would be able to represent the workforce effectiveness of team comprehensively and authentically.

Then, if D-A fit is to be extended to team construct as a valid indicator of team effectiveness, the next question should be this: how is such team D-A fit to be achieved? To answer the question, I examine the mechanism in which team level fit between team and its human resources emerge first. Then, I attend to complex dynamics inherent in teams and contend that systematic perspectives are warranted to build realistic understanding on fit between team and its squad.

Teams as Complex Adaptive System

Imagine any sports field. Generally, to predict performance of a specific player

and a team before the opening game of the season is highly difficult. Some players live up to fans' expectations while others don't. In addition, team's form usually fluctuates even during the single season. Quite often, one has difficulty in spotting the cause of such fluctuation, whether upward or downward. It is not rare that a team falters even when every player seems to perform his or her role quite well. Unfortunately, this uncertainty exerts its clout in organizational settings as well. Even when individual workers work hard and effectively, team as a whole might be so inefficient (Espinosa et al., 2004). When it comes to prediction of team's effectiveness (not description of it), complex is really the situation. During the lifecycle of many teams, some adversity or perturbation (systemic disturbance, disequilibrium, or imbalance) almost always occur (Edson, 2010). It is not unlikely that team composition that looked very desirable for the team task at one point of time is judged inappropriate at the next moment (Edson, 2010). That is, D-A fit of the overall team can be very unstable across time and situation. Some employee type can be very appropriate for the team today but other types might be needed badly instead of the yesterday's savior tomorrow. Then, what is the cause of such volatility? I assume that much of the uncertainty in the team derives from the inherent characteristics of work teams: teams as complex adaptive system.

Understanding how groups or teams operate has been the subject of studies by organizational behaviorists since early in the 20th century (Robbins & Judge, 2007). In those theoretical explorations, a substantial number of group studies have used sequential or phasic paradigms to create an understanding of group dynamics. Researchers in

organizational behavior and development, however, have come to understand that the past method based on rational and equilibrium seeking view of the world, while valuable in many ways, has been limiting. McGrath, Arrow, and Berdahl (2000) noted that

> *Much of that work, in line with a positivist epistemology that emphasizes control and precision (…) has also tended to treat groups as though they were simple, isolated, static entities. Recent research trends that treat groups as complex, adaptive, dynamic systems open up new approaches to studying groups. (p. 95)*

They recognize that human groups are dynamic, complex, and adaptive systems as many others (Aldrich, 1999; Axelrod, 1984; Axelrod & Cohen; 1999; Dosi, Nelson, & Winter, 2000; Haken, 2000; Lee et al., 1998; Lesourne & Orléan; 1998; Monge & Contractor, 2003; Morecroft & Sterman, 1994; Nelson & Winter, 1982). As organization is essentially a systemized whole consisting of interdependent and coordinated parts (Engelhardt & Simmons, 2002), teams are intricate human systems operating in multi-faceted organizational systems with multiple layers of complex human interactions (Edson, 2010). In fact, complex adaptive system theory is being recognized as a valid approach to studying groups and teams (Schneider & Somers, 2006) because conceptual and methodological approaches to studying groups and teams undergoing changes are needed. The application of complex adaptive system theory to team study is relatively

new. During the last 10 years, however, the theory has been suggested as a constructive way to view groups by researchers (Edson, 2010; McGrath, et al., 2000; Schneider & Somers, 2006).

According to Holland (1992, 1999), complex adaptive systems are dynamic networks that have several agents (e.g. cells, neurons, individuals) acting in coordination (e.g. neural networks, groups, and teams), continually acting in response to other agents and the environment. Determinants of end-states of a complex adaptive system are highly dispersed and decentralized. Emergent behavior or status of a complex adaptive system arises from cooperation, collaboration, and/or competition amongst agents in the system. The overall behavior of the system is the result of a huge number of decisions made every moment by many individual agents (Waldrop, 1992). Notably, work teams do possess the above-mentioned common characteristics of complex adaptive systems (Edson, 2010). More specifically, teams are complex adaptive systems that represent principles of self-organization and emergence. Self-organization or self-connecting refers to the system that starts with its parts separate (so that the behavior of each is independent of the others' states) and whose parts then act so that they change towards forming connections. Such a system is "self-organizing" in a sense that it changes from *parts separated* to *parts joined* (Ashby, 1962, p. 266). Work teams also self-organize. Performing team tasks, team members interact with each other, combining their resources and ideas (Faraj & Sproull, 2000; Lewis, 2000). In this coordinating process, individual members come to connect previously separate individual resources to make a task

performing system, which deals with many organizational dependencies interdependently (Espinosa et al., 2004). Next, emergence, or emergent properties, is the concept that the whole is not merely the sum of its parts. According to Checkland (1999), every model of a human activity system including work teams exhibits properties as a whole entity which derives from its component activities and their structure, but cannot be reduced to them (p. 314). Lichtenstein (2000) stated that emergence is a process of self-organizing. Similarly, Edson (2010) noted that self-organization and emergence collaborate in a work team such that self-organization supports function of teams and emergence serves as flow of teams linking function and structure of them. In short, prior research points that work teams, which are inherently self-organizing and emergent, are an example of complex adaptive system.

Then, if teams are complex adaptive systems as discussed above, D-A fit of the teams should be pursued in a way that matches the recognition. In what follows, I explore through what mechanisms positive outcomes such as D-A fit can be attained in complex adaptive systems.

Resilience of Teams

According to Miller and Page (2007), weathering uncertainty constitutes the primary concern of complex adaptive system. It is highly important to successfully manage internal and external uncertainty for a team in the organization. During the

lifecycle of many teams, some adversity almost always occurs (Edson, 2010). Adversity may occur as internal disruptions, competition, and/or environmental factors. For example, the team members make conflict; the team loses funding, resources, or essential personnel; the organization is sold and merged; the market fluctuates; or the economy changes. In these situations, fostering the ability to adapt to changes should parallels exploiting currently successful set of strategies or capabilities (March, 1991), because adaptive strategies of one time might turn into the useless or even burden for the whole system in a relatively short time span due to environmental changes and inherent instability of interactions in the system.

To adapt to changes, complex adaptive social system such as teams should have resilience (Miller & Page, 2007). Resilience is "an ability to recover from or easily adjust from misfortune or change" (Merriam-Webster Online, 2012). It has different meanings in different contexts (Walker & Salt, 2006). In engineering, resilience is the efficiency of a system's return to stability. Ecological resilience is preservation of a system's identity, integrity, and function in the face of changes in its environment. In complex adaptive social system, resilience comprises aspects of both engineering and ecological resilience. Specifically, organizational resilience is the degree of flexibility of an organization in response to change (Schein, 2004) adapting its structure while maintaining its function, which often entails emergence of new processes (behaviors, norms, and hierarchical structures).

Today, organizations do need to foster resilience for the adversity (Edson, 2010).

Engelhardt and Simmons (2002) stated that,

> *The need for organizational flexibility to accommodate a changing world is well understood. Today's high-velocity and competitive markets apply added pressure to adapt rapidly and perform at high levels. Technology is opening up new ways to compete while making old ways obsolete. These trends are recognized in strategic management theories that focus on constant change and speed. (p. 113)*

Senior editor at the Harvard Business Review, Coutu (2003) said, "More than education, more than experience, more than training, level of resilience will determine who succeeds and who fails" (p. 6). This same judgment can be applied to team as a collective. That is because the potential for organizational change or learning, which is very essential for the today's companies (Nonaka & Toyama, 2003), comes from teams that change and adapt (Chan, et al., 2003).

Exploring Variations

Then, how can a team secure resilience? Let's turn to other filed briefly, basketball (for the detailed discussion on professional basketball teams as complex

system, see Bar-Yam, 2003). The value of having a variety of different team plays is generally recognized in the game of basketball. Teams practice passes to set up different shots, establishing first options and, for the case of being blocked by the defense, second or third options as well. Teams prepare multiple options to deal with uncertainty originated from both inside and outside the team. Basically, uncertainty arises because moves of opponent team cannot be exactly known in advance. In addition, uncertainty occurs also because team play emerges from complex, dynamic interactions of players. Too often, game does not follow the prediction of the coach, even when the tactics and formation of the counterpart do not deviate considerably from the expectation. In this case, problem might be originated from inevitable complexity of interactions between players. Anyway, whichever the cause is, a basketball team should equip multiple tactics to confront uncertainty resulted from undeniable fact that a basketball team playing a game is a complex system with dynamic interactions facing unstable environment (Bar-Yam, 2003).

Not only for a basketball team but also for a work team are very critical having multiple options and the capability to come up with them. While teams may not be able to anticipate every adversity, teams can still develop capability to adapt and change to new conditions by preparing multiple alternatives. Because preparation reduces uncertainty, leaders may be able to develop competencies of resilience in their teams and organizations in a way of being prepared for the unexpected.

If the effectiveness of a person or a team (or for that matter any complex system)

is thought, it turns out that effectiveness is generally not related to a single possible action, but rather the set of all possible actions that one can do (Bar-Yam, 2003). Basically, preparing multiple options and continuously exploring the space of alternatives for better option is one and the most effective problem solving algorithm for complex systems (Beinhocker, 2007, p.194). Thus, increasing the number of ways one can act or react to environmental conditions is an important goal of complex systems in general (Bar-Yam, 2003). To achieve the goal, system needs *variation*; at any point in time, there should be multiple alternatives with varying capabilities. There should be also a process *selecting* the fittest options and then *replicating* successful strategies or behaviors and thus propagating their designs (Beinhocker, 2007, p.190).

Impressively, effective teams form naturally when there is a process of evolutionary selection: variation, selection, and replication (Bar-Yam, 2003). Actually, the evolution is the best algorithm for any complex system (Beinhocker, 2007, p.194). There can be multiple ways to complete the given team task. That is to say, there can be a variety of work designs in a single team regarding how to divide given tasks and to whom to allocate the divided parts of tasks. Yet the effectiveness of such alternatives might fundamentally vary. As the change of formation and tactics can make great difference in a basketball team without the change of the squad, fit between a specific worker and tasks assigned to him or her and subsequent overall team effectiveness can vary depending on the way in which the task structure is designed (Espinosa et al. 2004). It would be great if the optimal task design in a team can be deduced directly and

consequently make maximum D-A fit in the team. Unfortunately, however, optimal solution cannot be predetermined because teams in organizations are complex adaptive systems facing adversities as noted above. Instead, teams can learn. Substantial team learning and subsequent behavioral and structural change is derived from emergent properties generated by evolutionary process in team decision making (Senge, 1990; Mintzberg & Westley, 1992). By making changes and comparing varying results of them, teams accumulate experiences and learn how to cope with different types of tasks and dependencies. In short, teams make variations and progress stepping them. In industry, high reliability organizations, such as the United States Naval Aircraft Carrier Fleet (Burke, Wilson, & Salas, 2005) rely on this kind of feedback mechanism to build team competencies of resilience.

To summarize, the main way of building competitive teams in complexities is through the evolutionary process that includes variation, selection, and replication (Bar-Yam, 2003; Beinhocker, 2007). In this regard, diversity as a measure of the set of possibilities is a powerful tool for evaluating the effectiveness of a team as complex system (Bar-Yam, 2003). From this point of view, I posit that D-A fit will be enhanced as a team encourages its members to explore diverse variations regarding how to conduct teamwork, considering that overall team D-A fit is likely to be determined by complex interactions around the team as mentioned above.

Overrepresentation of Exploitation over Exploration

Although exploration of various alternatives is essential for teams, teams need to replicate or exploit currently successful strategies and task performing ways as well. However, it does not mean that it is okay to abandon exploration or experiment, focusing on only exploitation. Organizations and teams are required to hit the balance between exploration of alternatives and exploitation of current solution (Gibson & Birkinshaw, 2004; March, 1991; Raisch, Birkinshaw, Probst, & Tushman, 2009). That is, in systematic perspective, both *variation* and *replication* are needed for complex systems such as teams to adapt. Unfortunately, however, exploitation excessively outweighs exploration in organizations and teams generally (Beinhocker, 2007, p.356). Basically, while humans are good at accommodating new information to their existing mental models, they have difficulty in changing those models at a more fundamental level. In short, we tend to get stuck in our ways and reluctant to experiment. This *status quo* maintaining tendency originated from natural human preference for optimism and risk-aversion (Beinhocker, 2007, p.357-359) get even exacerbated in organizational settings.

In organizations, executives are often selected for their optimism. Lovallo and Kahneman (2003) noted that

> *The bearers of bad news tend to become pariahs, shunned and ignored by other employees. When pessimistic opinions are*

suppressed, while optimistic ones are rewarded, an organization's ability to think critically is undermined. The optimistic biases of individual employees become mutually reinforcing, and unrealistic views of the future are validated by the group.

This means that one is likely to find a greater proportion of optimists as one looks at nearer the top of the organizational hierarchy. This creates a barrier to variation because the optimists feel a less acute need to change or experiment than do realists (Beinhocker, 2007, p.358). Furthermore, in this business world of punctuated-equilibrium (characterized as recurring long-term stable states intermittently invaded by short term turbulences), the rigid are more likely to get to the top of the organization than the flexible (Harrington, 1998). From the structural perspective as well, organizations are easy to be rigid. The challenges of executing complex production and service processes, which today's organizations almost universally face, drive organizations to develop deep, densely connected hierarchies. Yet these structures are not appropriate to exploration, which require flatter, more autonomous organizational structures (Page, 1996). All of the above factors make the entire organization including teams favor exploitation over exploration. In fact in the industry, the drive toward "best practices" based upon efficiency, rationality, and standardization has prevailed in a tendency toward monoculture or dominance of the few (Frank & Cook, 1995).

In sum, even though experiments and having a variety of alternatives are

important for teams as complex system in a changing organizational environment, the reality is that the organization, teams, and employees in them are likely to be overly skewed toward exploitation of *status quo*. In this light, for a team to achieve D-A fit at the team level, variation-increasing mechanisms need to be purposefully introduced to the team.

Injection of Diversity

According to Beinhocker (2007), the most crucial counter to this unbalance between exploitation and exploration is to deliberately create a diversity of perspectives and experiences in the organization by composing teams with heterogeneous people because perhaps the most critical levers in a social architecture of the organization are the company's human resources (p.376). In this regard, to tackle the over-stability, the organization needs people with "different industry [experiences], functional backgrounds, international experiences, entrepreneurial experiences, corporate experiences, nonbusiness experiences, and so on. (p.361)" A diverse set of mental models from employees with heterogeneous experiences raises the probability that at least one of them will notice important changes in the environment and have fresh ideas about how to respond to them. In fact, many of teams' greatest strengths and adaptability came from the diversity of viewpoints and inputs into the project (Edson, 2010). When viewed through the lens of complex system, diverse points of view from heterogeneous members

stimulate self-organized variation (Jehn, Northcraft, & Neale, 1999; Page, 2007), which is inherently inhibited in the organization. Recognizing this, I suggest that heterogeneity of team members should be maintained deliberately in terms of experiences, behaviors and perspectives to vitalize exploration, which is inherently anemic in the organization, and that D-A fit of the team could be subsequently improved in a complex systematic point of view once experiments are briskly conducted in the team owing to the enhanced heterogeneity. In the following section, I address three types of member heterogeneity in which synergy can operate in work teams to bring in diverse experiences, behaviors and perspectives: a) formal functional diversity that brings in complementary experiences, b) informal role diversity that expands the range of coping behaviors of the team, and finally c) cognitive diversity that presents heterogeneous perspectives.

In addition, I address possible contingencies for the effects of team member diversity: a) team need for cognition, and b) task routineness.

HYPOTHESIS DEVELOPMENT

Function

Functionally heterogeneous teams bring in a variety of experiences by assembling people from different disciplines and functions (Earley & Mosakowski, 2000). Such teams have high flexibility in response to very diverse and complex tasks, which teams frequently face todays (Espinosa et al., 2004). When a team should accomplish a complex task, which are composed of heterogeneous parts, functionally homogeneous team would not be able to deal with entire aspects of the task well because of its narrow team member experience band. A single team project can require diverse functional experiences including strategic planning, accounting, designing and marketing simultaneously. In this regards, functionally diverse teams are increasingly identified as the solution to the challenges of new forms of organization and volatile environments (Curral, Forrester, Dawson, & West, 2001; Keller, 2001). In addition, such teams have high absorptive capacity, as their members' diverse expertise allows them to utilize a broad range of information and knowledge (Ancona & Caldwell, 1992; Dahlin & Weingart, 1996; Lovelace, Shapiro, & Weingart, 2001). This enhances the probability that a variety of quality solutions to the problem will be derived. In this regard, functional heterogeneity is expected to enhance variation-generating process of a team

based on broad experiences it offers. In fact, research has shown that functional heterogeneity is important for innovation, renewal, and creativity in organizations (Dahlin & Weingart, 1996; Schneider & Northcraft, 1999; Woodman, Sawyer,&Griffin, 1993). In this light, considering the above noted point that diverse experiences and perspectives are needed for variation to emerge, I assume that a team with functional heterogeneity will be more likely to conduct experiments, which are essential to overcome inherent inhibition of exploration, and that, subsequently, team level D-A fit will get improved because a work design that allows for optimal D-A fit can be found only through an evolutionary algorithm in a complex adaptive system like work teams. Hence, I predict the following:

Hypothesis 1a. Functional diversity in a team will be positively related to team D-A fit.

Role

Formal functionality apart, informal role composition can be also very important in work teams regarding adaptability of the teams. A role is defined as a set of behaviors that are interrelated with the repetitive activities of others and characteristic of the person in a particular setting (Biddle, 1979; Forsyth, 1990; Katz & Kahn, 1978). From this definition, roles represent patterns of individual coping behaviors resulting

from interaction with other team members beyond behaviors originated from assigned formal function. These individual roles collectively combine to form team level constructs that represent behavioral patterns of group process (Kozlowski, Gully, Nason, & Smith, 1999; Morgeson & Hofmann, 1999). According to Mumford, Van Iddekinge, Morgeson, and Campion (2008), diverse roles are necessary for "effective internal execution of the team's work, effective management of the team's relationship with its environment, and preservation of the team's vitality (Hackman, 1987; McGrath, 1984; Sundstrom, De Meuse, & Futrell, 1990)." Specifically, heterogeneous role configuration enables the team to have more flexible set of coping strategies to task and environments, thus making the team better suited for requirements posed in dynamic team environments (Mumford et al. 2008). From this perspective, I posit that a team with heterogeneous role composition will be more suited for experimenting and have better chance of getting optimal D-A fit as in the case of formal functional background. Hence, I predict the following:

Hypothesis 1b. Role diversity in a team will be positively related to team D-A fit.

Cognitive Style

Third domain I attended to is complementarity in cognitive styles of team

members. Diversity in cognitive style refers to heterogeneity among team members regarding how to construe the world and what schemata they usually rely on (Van der Vegt & Janssen, 2003). Cognitive diversity can enable active generation of variation via combining different ideas, building on others' ideas, and experimenting with the ideas of those with different perspectives by providing team members with a wide range of ideas, perspectives, knowledge, and values (Harrison, Price, Gavin, & Florey, 2002; Horwitz & Horwitz, 2007; Joshi & Roh, 2009; van Knippenberg et al., 2004). In addition, heterogeneous cognitive style can stimulate team members to experiment diverse work designs by allowing broader range of tasks to be smoothly allocated among team members because preferred task styles can vary depending on the focal employee's cognitive style. Indeed, previous studies suggest that cognitive diversity is positively related to creative performance, which is closely related to capabilities to introduce exploration (Jackson et al., 2003; Kurtzberg & Amabile, 2001; Perry-Smith & Shalley, 2003). In this regard, I expect that cognitive team diversity will be significantly related to D-A fit of teams because it is likely to enhance variation generating process by presenting heterogeneous perspectives. Thus, I predict the following:

. *Hypothesis 1c. Cognitive style diversity in a team will be positively related to team D-A fit.*

Moderators: Need for Cognition and Task Routineness

Even if member diversity exists in a team, it might not lead to brisk experimentation and exploration under certain situations. On the other hand, it is also possible that variation can be made in a certain team having relatively low level of member heterogeneities. That is to say, situational contingency can modify the relationship between member diversity and team D-A fit. To address this issue, I discuss two possible moderators as follows.

First of all, I suggest that when team members enjoy thinking about which team structure would be better and abstain rushing to the premature conclusion, the effect of team diversity on exploration and subsequent D-A fit will be enhanced. When tasks are allocated to the members, nobody can know exactly what the best match is in advance. The best state of team coordination can be achieved only by experiments and mutual adjustments among members. Fundamentally, experiment is a trial and error process. It must entail considerable extent of ambiguity. From this point of view, I propose that team need for cognition will strengthen the positive relationship between diversity and team D-A fit by making team members more tolerable to the ambiguity resulted from experimentation. Need for cognition refers to an individual's tendency to engage in and enjoy effortful cognitive endeavors (Cacioppo, Petty, Feinstein, & Jarvis, 1996). And it has been shown that need for cognition is positively associated with attributional complexity, cognitive innovativeness, and tolerance of ambiguity (Cacioppo et al.,

1996), all of which are needed attributes for experiments at workplace. In fact, according to Kearney, Gebert, and Voelpel (2009), team level need for cognition enhances positive effect of team diversity on team performance. Research has shown that whether individuals engage in an in-depth processing of information is in large part determined by their motivation to do so (Chaiken & Trope, 1999). Although this motivation has received little attention in diversity research (for exception, see Kearney et al., 2009), it is likely to be a key determinant of how well a team utilizes its heterogeneous or complementary pool of talents (Kearney et al., 2009). In this sense, I propose that team need for cognition will moderate the relationship of D-A fit and three team diversity domains I addressed.

Hypothesis 2a. Team need for cognition will moderate the functional diversity—team D-A fit relationships such that the relationships will be more positive under high level of team need for cognition.

Hypothesis 2b. Team need for cognition will moderate the role diversity—team D-A fit relationships such that the relationships will be more positive under high level of team need for cognition.

Hypothesis 2c. Team need for cognition will moderate the cognitive diversity—team D-A fit relationships such that the relationships will

be more positive under high level of team need for cognition.

Secondly, I propose that if team task is performed in a very routine way, the impact of member diversity will be strengthened. When task routineness is so high, work is very likely to be done by organizational manual or other structural mechanism, instead of relying on individual member's creativities or discretions. In this case, tendency to maintain *status quo* is expected to be very salient. This is the extreme case of general state of teams in organization that tend to favor exploitation. If there is little diversity in a team with highly routine tasks, it is very likely that the team as a whole does not explore at all for the alternative ways of working because employees might feel there is no need to experiment and take risks doing routine tasks. Ironically, however, in this stability-favoring situation, the effect of diversity can outstand, because even a little amount of experiment could add value where exploration is rarely performed (Levinthal & March, 1993; March, 1991). Hence, I argue that team task routineness will moderate the relationship of D-A fit and three team diversity domains as what follows.

Hypothesis 3a. Team task routineness will moderate the functional diversity—team D-A fit relationships such that the relationships will be more positive under high level of team task routineness.

Hypothesis 3b. Team task routineness will moderate the role

diversity—team D-A fit relationships such that the relationships will be more positive under high level of team task routineness.

Hypothesis 3c. Team task routineness will moderate the cognitive diversity—team D-A fit relationships such that the relationships will be more positive under high level of team task routineness.

Team Performance

I hypothesize that increased D-A fit based on team member diversity will lead to higher team performance. By definition, D-A fit means task-related demands of team was satisfied. Team needs appropriate workforce to effectively accomplish given tasks. When these needs are met by its members, it can be said that demands of team fit abilities of team members. It is natural that a team whose task-related demands are satisfied outperforms those that failed to extract appropriate contributions from their team members, provided that team performance usually refers to the extent to which teams competently complete their tasks (De Dreu & Weingart, 2003; Dionne et al., 2004; Marks et al., 2001).

Hypothesis 4. Team D-A fit will be positively related to team performance.

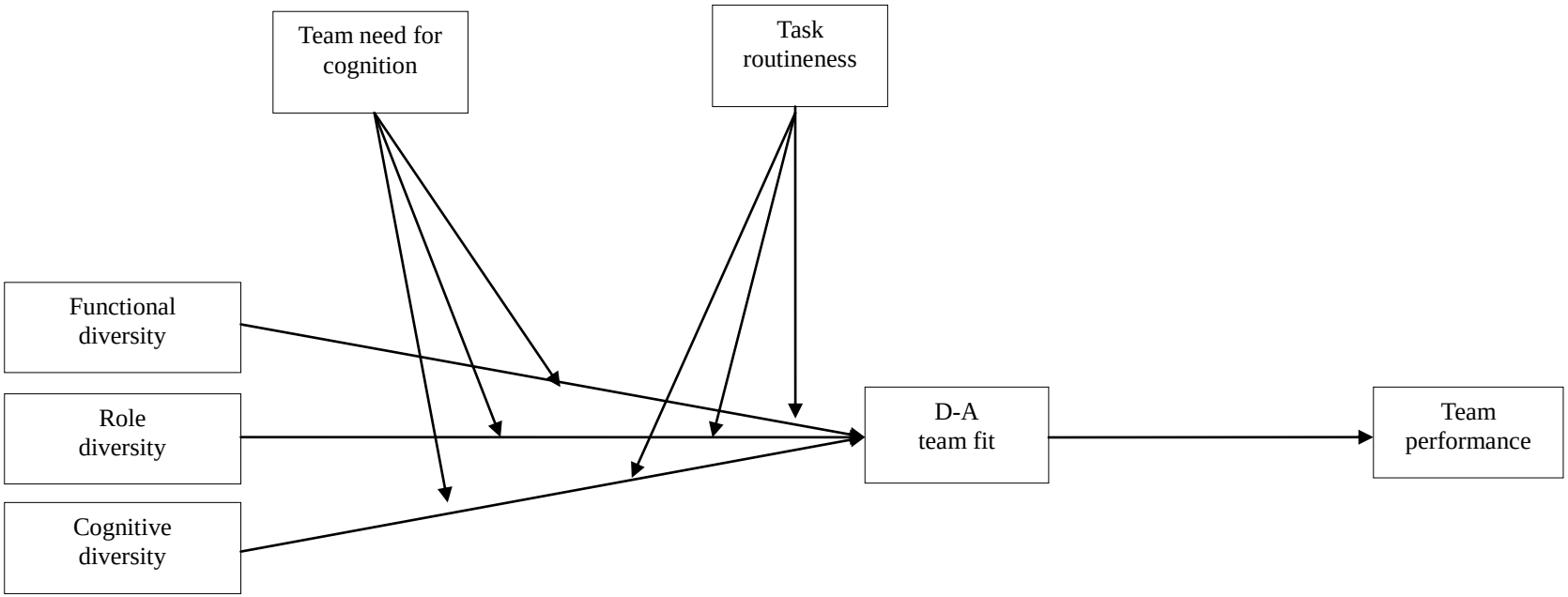

Figure 1. Conceptual framework.

METHODS

Participants and Procedures

Data were collected from subordinates and their supervisors of 44 teams in three organizations located in South Korea. In this study, I defined a work team as a group of employees that (1) formed the smallest functional unit in the organization, (2) reported directly to the same supervisor, and (3) worked together on a permanent basis. All the work teams were well delineated: the members identified themselves with the teams, and the management identified the members with the teams.

Invariably, team members interacted at least once a day in team meetings and/or in their tasks. The average team size was 3.52 members (ranging from 2 to 11), and members' average team tenure was about 19.73 months. In general, the team members had a considerable level of task interdependence (scoring 5.51 on a seven-point scale with 7 equal to "to a very large extent") with the other team members. Participation was voluntary, and the respondents were assured of the anonymity of their responses. All were assigned pre-coded questionnaires to facilitate the matching of the subordinate-supervisor surveys. The surveys were collected during work hours, sealed right away with enclosing envelope once finished and mailed back to the researcher.

A total of 175 matched employee-supervisor questionnaires were returned (a 55.36 percent response rate). Because of missing data (some participants sent survey

paper leaving unanswered), the final sample used in the analyses comprised 155 employee-supervisor matched questionnaires from 44 teams. Their demographic data are as follows: 48.39 percent of the employees were female; their average age was 31.87 years; and their average organizational tenure was 4.73 years. Of the supervisors, 29.55 percent were female; their average age was 41.47 years; and their average organizational tenure was 12.35 years.

Measures

All measures except for informal role and demographic variables were rated on a scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). Surveys were administered in Korean. The surveys were initially written in English and then translated into Korean using the back-translation procedure (Brislin, 1986). Specifically, two individuals independently translated the survey from English to Korean. There was 83 percent agreement between the translators regarding word choice and expression. A third one translated the survey, which were adjusted to converge the differences of the above two versions, back to English. During this procedure, thirteen words or phrases in the Korean version that did not match, when translated, those in the English version were corrected.

Functional diversity. Participants chose one of the functional backgrounds among 9

options: strategic planning, marketing, operations, R & D, human resource management, finance, general management, accounting, and etc. Then, at team level, functional complementarity was calculated by using entropy-based diversity index (Pfeffer & O'Reilly, 1987; Teachman, 1980). According to Harrison and Klein (2007), entropy index can be used as an index of variety when within units, members differ from one another qualitatively—that is, on a categorical attribute such as functional background.

$$H = -\sum_{i=1}^{n} P_i(\ln P_i)$$

Role diversity. Informal roles were assessed with the SYMLOG Adjective Rating Form (Bales & Cohen, 1979). Stweart et al. (2005) noted that "a universally accepted taxonomy of team members' roles does not exist…perhaps the only empirically supported categorization of roles is Bales' role categories." The form contains groupings of behavioral descriptors and asks participants to rate how accurately the descriptors reflect the behavior of a target individual. Response choices are "never," "rarely," "sometimes," "often," and "always." Three distinct role dimensions (positive-negative, upward-forward, and friendly-unfriendly) are assessed by summing scores of 26 behavioral descriptors in SYMLOG. The three dimensions of role measure are obtained from ratings of behaviors demonstrating "analytical," "task-oriented," "problem

solving," "cooperative," "friendly," and "equalitarian" actions. Although common statistics such as internal consistency coefficient cannot be derived for the SYMLOG scale because of the unique characteristics of the scale that was designed to assess multiple dimensions with single item, the construct validity of these dimensional ratings is well established (Cohen, 1970). In their book, Bales and Cohen (1979) presented how to calculate score for each of three dimensions from survey results of 26 items. Ratings of three role dimensions for individual team member were then aggregated to form team-level constructs. Team-level role diversity was operationalized as mean Euclidian-distance of team members from each other. According to Harrison and Klein (2007), mean Euclidian distance (Tsui et al., 1992) can be used to derive an index for a diversity, when the diversity conceptually satisfies the following assumptions: (a) within teams, members differ from one another in their position along a continuum; (b) teams differ in the degree to which their members are collocated along S—in some teams, members are close to one another, but in other teams, members are more dispersed; and (c) differences among teams in the extent to which their members are spread along S lead to systematic consequences. Conceptually, if each of three role dimensions is assumed as S, it satisfies the above three assumptions. Because I needed to represent comprehensive patterns of three role dimensions simultaneously, I calculated mean Euclidian distance in a 3-dimensional coordinates system, in which the three dimensions of role serve as axes. Although Tsui et al. (1992)'s original formula deals with only one dimension, the fundamental principle is the same: the average of geometric distance derived from all

possible combinations of two points in Euclidian space. Following Nunally & Bernstein (1994)'s mention that the assumption of orthogonality can present desirable results even when there are some inter-correlations between factors, I calculated the distance based on Cartesian (rectangular) coordinate system.

Cognitive diversity. I measured the teams' cognitive diversity using Van der Vegt and Janssen's (2003) four-item measure. The subordinates were asked to indicate the extent to which the members of their team differ in their way of thinking, in their knowledge and skills, in how they see the world, and in their beliefs about what is right or wrong (1 "to a very small extent"; 7 "to a very large extent"). I aggregated the individual responses to compute group-level cognitive diversity (individual-level α = .82; ICC1 = .42, ICC2 = .46, $F_{43, 111}$ = 1.85, p < .01). Although ICC2 value was somewhat smaller than .70 rule of thumb, I decided to aggregate the variable with support of ICC 1 significance test result, considering the fact that ICC 2 is substantially affected by group size.

Team D-A fit. Team D-A complementary fit was measured items adopted from Cable and DeRue (2002). To represent D-A fit between team and overall squad of team members in systematic perspective, I modified the items to use 'our team member's' instead of 'my'. Specifically, items were "our team members' knowledge, skill, and abilities are a good fit with the requirement of our team members' job; our team members' abilities and education provides a good match with the demands that our team

members' job places on them; the match is very good between the demands of our team and our team members' skills." Team level D-A fit was measured by aggregating individual responses (individual-level α = .90; ICC1 = .49, ICC2 = .60, $F_{43, 109} = 2.44$, $p < .01$). To more validate measuring the team-level D-A fit from team members, I additionally collected team level D-A fit score from supervisors (α = .88). The correlation between D-A fit measured by supervisors and aggregated one from their members were significantly positive ($r = .58$, $p < .01$) showing considerable convergence.

Team performance. I assessed general team performance with Liden, Wayne, and Stilwell (1993)'s four-item scale from supervisors of teams. An example item is "rate the overall level of performance that you observe for this team." Internal consistency coefficient alpha was .95.

Team need for cognition. I measured this variable with five items from need for cognition scale (Cacioppo et al., 1996). Participants were asked how much each statement was characteristic of them. Sample items are, "I find satisfaction in deliberating hard and for long hours," "I really enjoy a task that involves coming up with new solutions to problems," and "learning new ways to think doesn't excite me very much" (reverse-coded). Drawing on Kearny et al. (2009), I conceptualized team need for cognition using an additive composition model (Chan, 1998), in which the team level construct is the mean of the individual characteristics. Individual level internal

consistency coefficient alpha was .74.

Task routineness. The task routineness measure was comprised of five items drawn from Gladstein's (1984) task complexity measure and related literature. Sample items are "the technology, required skills, and information needed by the team are constantly changing; during a normal work week, exceptions frequently arise that require substantially different methods or procedures for the team; there is something different to do here every day; for almost every job I do, there is something new happening almost every day." I calculated team level task routineness by aggregating team members' responses (individual-level $\alpha = .63$; ICC1 = .39, ICC2 = .39, $F_{43, 110} = 1.63$, $p = .02$).

Control variables. I controlled average tenure of team members, team size, team level task interdependence (Campion et al., 1993; individual-level $\alpha = .67$; ICC1 = .37, ICC2 = .33, $F_{43, 111} = 1.49$, $p = .05$), and affective organizational commitment (Allen & Meyer, 1990; $\alpha = .89$) in analyses. Tenure was controlled because it was expected to affect individual D-A fit in two ways. First, as tenure accumulates, reluctance for exploration increases (Beinhocker, 2007, p.360) and, as a consequence, it might put a lid on the development of D-A fit. On the other hand, however, it is also possible that as tenure increases, employee might get adapted to and understand the needs of organization better. In this case, tenure will enhance the individual D-A fit. Whichever the direction of tenure effects is, tenure needs to be controlled. Team size was controlled to avoid restriction bias. It would be inherently difficult for a small team to have a variety of

talents. It is natural limit originated from the size. And task interdependence is expected to affect the complexity of teams. When task interdependence is negligent, there would be less complexity in the team because there will be less interaction between team members. As complexity level changes, D-A fit level can change along. Affective organization commitment was controlled because it is easier for team members collaborate and take risks while experimenting when team members identify with the organization.

RESULTS

Psychometric Characteristics of the Measure

Before testing hypotheses, I conducted factor analyses to confirm my team D-A fit measure was not confounded by respondents' other attitude domain. As long as team D-A fit is measured with self-reports, there is always a possibility that respondents rated their team's D-A fit high merely because they are emotionally attached to the organization and being in the organization makes them feel good. Specifically, I wanted to test discriminant validity of team D-A fit from affective organizational commitment and organization-based self-esteem. Affective organizational commitment refers to the extent to which an employee identifies him or herself with the organization. And organization-based self-esteem is the self-perceived value that individuals have of themselves as organization members acting within an organizational context (Pierce, Gardner, Cummings, & Dunham, 1989). Affective organizational commitment was assessed with three items adopted from Allen and Meyer (1990)'s scale as noted above and organization-based self-esteem was measured with five items adopted from Pierce et al.'s (1989) scale (α = .88).

First, I conducted explanatory factor analysis (EFA) using principal component analysis. In this analysis, total of three factors was extracted based on a standard of

eigen-value of 1 (Kaiser, 1974) explaining 76.24% of total variance. Table 1 presents the factor loading results from EFA with varimax rotation. As can be seen, all items seemed to load on the originally intended factors.

Table 1

EFA Results

	Factor 1	**Factor 2**	**Factor 3**
Items			
team D-A fit 1	.10	.34	**.82**
team D-A fit 2	.18	.10	**.90**
team D-A fit 3	.15	.29	**.87**
affective organizational commitment 1	.14	**.89**	.25
affective organizational commitment 2	.33	**.71**	.26
affective organizational commitment 3	.26	**.84**	.26
organization-based self-esteem 1	**.84**	.23	.08
organization-based self-esteem 2	**.70**	.34	.07
organization-based self-esteem 3	**.79**	-.04	.15
organization-based self-esteem 4	**.68**	.40	.19
organization-based self-esteem 5	**.83**	.20	.14
Eigen value	5.48	1.84	1.07

Note. N = 235. Bold faced numbers represent the factor on which each item loaded most highly.

Next, I performed confirmatory factor analysis (CFA) to confirm discriminant validity of D-A fit from other attitude types. Using factor analysis, evidence of discriminant validity can be shown when items associated with one construct do not significantly load on other construct that are related (Garver & Mentzer, 1999). Specifically, this test can be done by establishing that a single-factor model in which the covariance between the latent factors for one construct and the other is set to 1.0 does not provide a better fit to the data than a model in which the covariance is estimated. Two-factor models (D-A fit and affective organizational commitment: χ^2= 26.92, *df* = 8; D-A fit and organization-based self-esteem: χ^2= 56.67, *df* = 19) presented better fit than one-factor model (D-A fit and affective organizational commitment: χ^2= 191.90, *df* = 9; D-A fit and organization-based self-esteem: χ^2= 293.63, *df* = 20) in which items of both D-A fit and other attitude construct (D-A fit and affective organizational commitment: $\Delta\chi^2$= 164.98, *df* = 1, $p < .01$, D-A fit and organization-based self-esteem: $\Delta\chi^2$= 236.96, *df* = 1, $p < .01$).

Descriptive Statistics

Table 2 presents the means, standard deviations, and correlations of variables. Interestingly, tenure showed significant positive correlation with affective organizational commitment (r = .46) and negative correlation with cognitive diversity (r = -.39). This

implies the longer employees work for a company, the more they come to like the company and become similar with coworkers. According to Schneider (1987), an organization selectively retains employees who fit its own culture and structure. From this perspective, tenure effects can be spurious and interpreted as range restriction. On the other hand, according to Festinger (1957)'s cognitive dissonance theory, employees might have come to adapt to the inevitable fact that they should do with the company for a living. This means there could be real effects of tenure. I guess that the both of company selection and employee adaptation exert influence simultaneously. In addition, correlation table shows that as other studies have shown (Meyer, Stanley, Herscovitch, & Topolnytsky, 2002), affective organizational commitment is positively correlated to performance (r = .52).

Main Effects of Diversity Measures on Team D-A Fit

To test hypotheses, I conducted hierarchical linear regression using team level variables. The results are presented in Table 3. In Model 1, I controlled the effects of tenure, team size, task interdependence and affective organizational commitment on team D-A fit. As expected, tenure (β = .21, t = 1.88, p < .10) and affective organizational commitment (β = .73, t = 5.72, p < .01) were positively related with team D-A fit.

Table 2

Descriptive Statistics and Correlations

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. mean tenure	4.58	2.52	-										
2. team size	3.52	1.90	.11	-									
3. task interdependence	5.50	0.58	.06	.01	(.67)								
4. affective organizational commitment	5.31	1.00	.46**	.07	.08	(.89)							
5. functional diversity	0.53	0.37	.04	.37**	.14	-.01	-						
6. role diversity	3.40	1.52	-.03	.37**	.01	.02	.30*	-					
7. cognitive diversity	3.85	0.93	-.39**	-.20	-.10	-.56**	-.13	-.04	(.82)				
8. team need for cognition	4.43	0.63	-.13	-.28	.23	-.05	-.18	-.12	.22	(.74)			
9. task routineness	3.27	0.59	-.25	-.16	-.10	-.19	.01	-.03	.08	.21	(.63)		
10. team D-A fit	4.97	1.02	.36*	-.03	-.23	.69**	.01	.09	-.60**	-.09	-.15	(.88)	
11. team performance	5.28	1.06	.28	.08	.16	.52**	-.17	.18	-.46**	.01	-.25	.57	(.80)

Note. $N = 44$. * $p < .05$, **, $p < .01$. Two-tailed test. Individual level coefficient αs are presented in parentheses.

Table 3

Regression Results: Team D-A Fit as Dependent Variable

	Model 1			Model 2			Model 3			Model 4		
Variables	**β**	***t***	R^2	**β**	***t***	R^2	**β**	***t***	R^2	**β**	***t***	R^2
mean tenure	.21 †	1.88†		.19†	1.71†		.19	1.62		.53**	5.63**	
team size	-.02	-0.14		-.07	-0.54		-.08	-0.61		.11	0.98	
task interdependence	-.06	-0.53		-.18	-1.38		-.20	-1.42		-.32**	-3.4**	
affective organizational commitment	.73**	5.72**		.55**	3.72**		.57**	3.62**		.86**	5.32**	
functional diversity				-.17	-1.34		-.14	-0.96		.01	0.11	
role diversity				.23†	1.68†		.25	1.63		.20	1.63	
cognitive diversity				-.26†	-1.75†		-.25	-1.67		.02	0.16	
team need for cognition							-.04	-0.34		-.10	-1.14	
task routineness							-.06	-0.50		-.85**	-3.66**	
functional diversity × need for cognition										.20*	2.24*	
role diversity × need for cognition										-.43**	-3.03**	
cognitive diversity × need for cognition										.53*	2.62*	
functional diversity × task routineness										.71**	3.87**	
role diversity × task routineness										.55**	3.65**	
cognitive diversity × task routineness										.06	0.45	
			.70			.75			.75			.94

Note. $N = 44$. † $p < .10$, * $p < .05$, **, $p < .01$. Two-tailed test. $\Delta R^2 = .05$ from Model 1 to Model 2 ($p = .19$), .00 from Model 2 to Model 3 ($p = .86$), and .19 from Model 3 to Model 4 ($p < .01$)

Model 2 of Table 3 presents test results of Hypothesis 1, which predicted positive impact of team member heterogeneity on D-A fit. Specifically, Hypothesis 1a expected that functional diversity of team members will be positively related to team D-A fit. In Model 2, functional diversity in team does not show significant relationship with team D-A fit, thus not supporting Hypothesis 1a. In contrast, heterogeneity in team members' role had positive relationship with D-A fit ($\beta = .23$, $t = 1.68$, $p < .10$). Hence, Hypothesis 1b was supported. Hypothesis 1c expected positive link between team cognitive diversity and team D-A fit. Yet cognitive diversity turned out to be negatively related to team D-A fit ($\beta = -.26$, $t = -1.75$, $p < .10$) as can be seen Model 2 in Table 3. Thus, Hypothesis 1c was not supported.

Moderating effects of team need for cognition and task routineness

Hypothesis 2 and 3 addressed possible moderating effects of team need for cognition and task routineness on the relationship between member diversity and team D-A fit. To test the interaction effects, I centered the three diversity variables and two hypothesized moderators, and made product terms with the centered variables. The results are presented in Model 4 of Table 3. The two-way interaction terms added unique variance ($R^2 = .94$, $\Delta R^2 = .19$, $p < .01$) validating the inclusion of moderating effects.

I predicted in Hypothesis 2a that team need for cognition will moderate the functional diversity—team D-A fit relationships such that the positive relationships will

be stronger under high level of team need for cognition condition. The product term of functional diversity and team D-A fit was significant (β =.20, t = 2.24, p < .05). To illustrate the form of the two-way interaction, I created two combinations of functional diversity and team need for cognition (cutoffs at one standard deviation above and below the mean) and plotted one slope for each group (Aiken & West, 1991). I present the plots in Figure 2. As expected when team need for cognition was high, functional diversity was positively related to team D-A fit. On the contrary, however, functional diversity seemed exerting negative impact on team D-A fit. In short, the slope was positive under high team need for cognition condition and negative under low team need for cognition condition. Thus, Hypothesis 2a was supported.

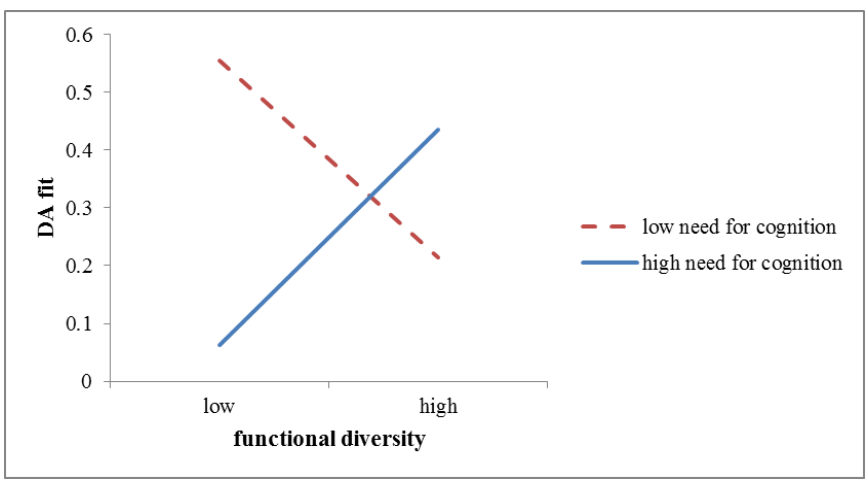

Figure 2. Two-way interaction plot of functional diversity and team need for cognition predicting team D-A fit.

The interaction term 'role diversity × need for cognition' was also significant (β = -.43, t = -3.03, p < .01). Simple slope plots for the product term are presented in Figure 3. When team need for cognition was low, role diversity maintains its positive relation with team D-A fit. Surprisingly, however, the relationship between role diversity and team D-A fit turned negative as team need for cognition increased. This was the opposite of my prediction that the positive relationship will be strengthened under high need for cognition. Hence, Hypothesis 2b was not supported. Hypothesis 2c predicted that need for cognition will moderate the cognitive diversity—team D-A fit relationships such that the positive relationships will be stronger under high level of team need for cognition. The product term representing the interaction

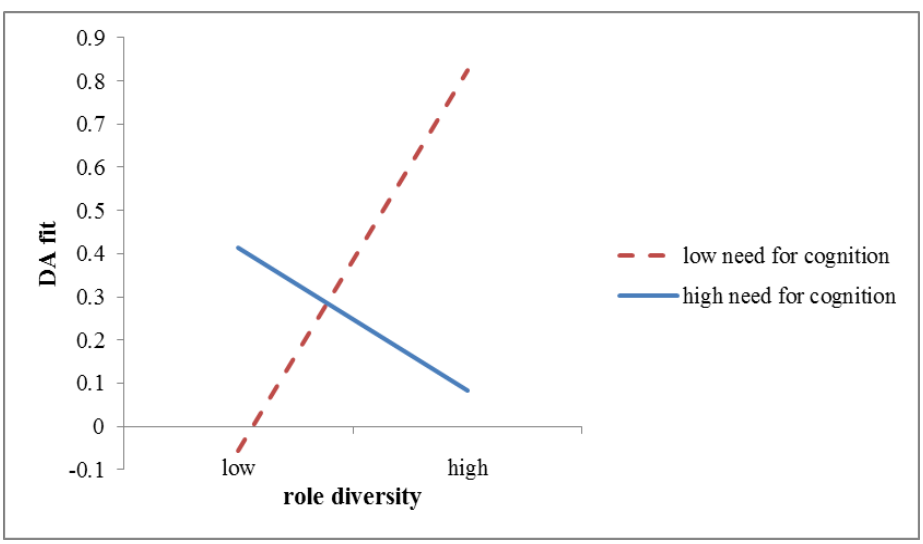

Figure 3. Two-way interaction plot of role diversity and team need for cognition predicting team D-A fit.

effect (cognitive diversity × need for cognition) was also significant (β = .53, t = 2.62, p < .05). I plotted simple slopes for the product term in Figure 4. In accordance with Hypothesis 2c, when team members have relatively high need for cognition on average, the negative main effect of cognitive diversity turned positive. Thus, Hypothesis 2c was supported.

Hypothesis 3 mentioned task routineness as a possible moderator for the diversity—D-A fit relationships. Interestingly, when the effect of task routineness was refined by including moderators, it turned out that task routineness was negatively related to team D-A fit (β = -.85, t = -3.66, p < .01). This is in line with earlier discussion that overrepresentation of stability or exploitation will harm team's capacity for generating variation and D-A fit subsequently.

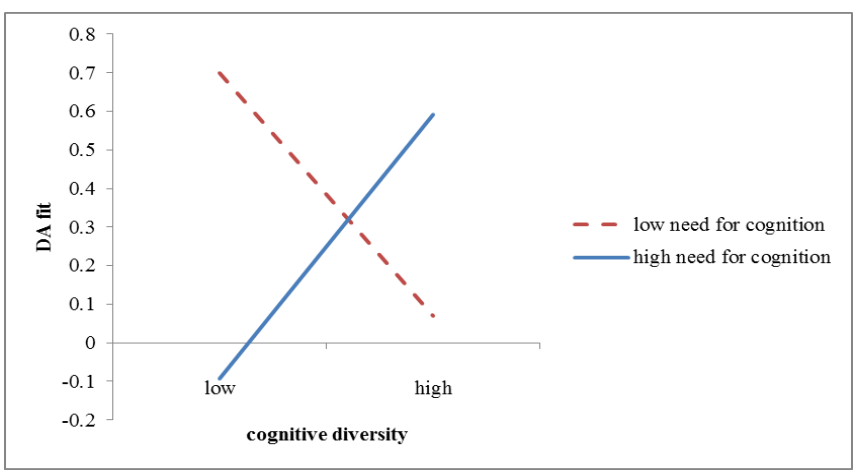

Figure 4. Two-way interaction plot of cognitive diversity and team need for cognition predicting team D-A fit.

Specifically, Hypothesis 3a predicted that the relationship between functional diversity and team D-A fit will be more positive in a team with routine tasks. The product term 'functional diversity × task routineness' was significant at alpha level of .01 ($\beta = .71$, $t = 3.87$, $p < .01$). Simple slopes for the illustration are shown in Figure 5. In Figure 5, when tasks are routine, functional diversity enhances team D-A fit, while it deters form of team D-A fit with flexible tasks. That is, the relationship between functional diversity and team D-A fit was positive under high task routineness condition and negative under low task routineness condition, supporting Hypothesis 3a.

In Hypothesis 3b, I expected that the influence of role diversity also would be moderated by task routineness in a similar fashion with the case of functional diversity. The two-way interaction term representing moderating effect of task routineness on role diversity—team D-A fit relationship was significantly positive ($\beta = .55$, $t = 3.65$, $p < .01$). The shape of interaction effects is presented in Figure 6. As expected, role diversity was positively related to team D-A fit when task was routine. On the other hand, role diversity was negatively related to D-A fit under low task routineness condition. So, Hypothesis 3b was supported.

Hypothesis 3c predicted that team task routineness will moderate the cognitive diversity—team D-A fit relationships such that the relationships will be more positive under high level of team task routineness. Yet the product term 'cognitive diversity × task routineness' was not significant. Hence, Hypothesis 3c was not supported.

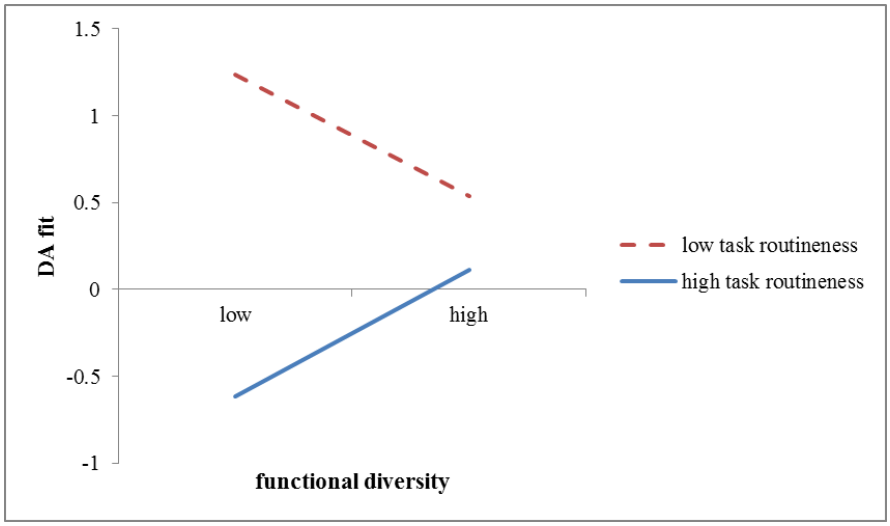

Figure 5. Two-way interaction plot of functional diversity and task routineness predicting team D-A fit.

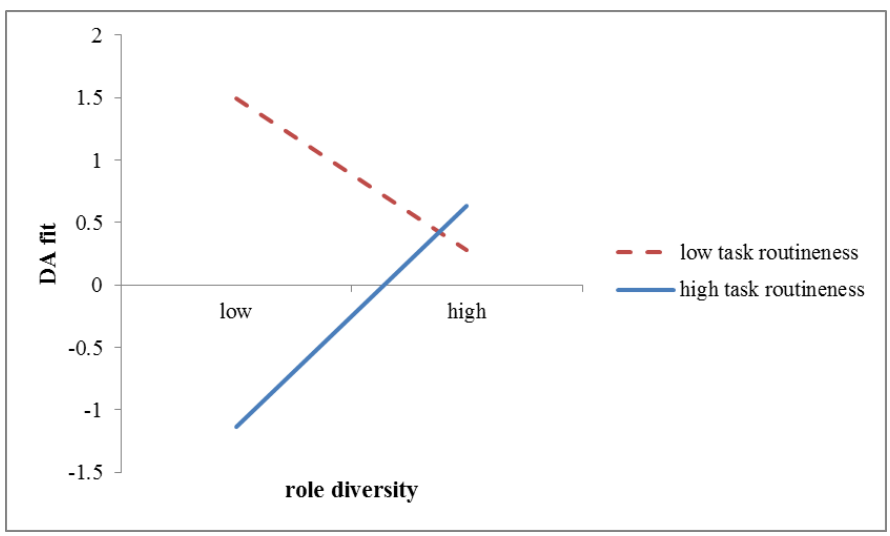

Figure 6. Two-way interaction plot of role diversity and task routineness predicting team D-A fit.

Table 4

Regression Results: Team performance as Dependent Variable

	Model 1			Model 2			Model 3			Model 4		
Variables	**β**	***t***	R^2	**β**	***t***	R^2	**β**	***t***	R^2	**β**	***t***	R^2
mean tenure	.05	0.33		.01	0.08		.03	0.22		.02	0.15	
team size	.04	0.27		.08	0.65		.02	0.12		.12	0.88	
task interdependence	.12	0.86		.28*	2.08*		.15	1.16		.31*	2.35*	
affective organizational commitment	.49**	3.22**		.11	0.57		.33*	2.09*		.07	0.37	
functional diversity							-.31*	-2.23*		-.33*	-2.56*	
role diversity							.25†	1.80†		.18	1.36	
cognitive diversity							-.28†	-1.76†		-.08	-0.48	
D-A fit				.56**	3.02**					.53**	2.64**	
			.29			.43			.44			.53

Note. $N = 44$. † $p < .10$, * $p < .05$, **, $p < .01$. Two-tailed test. $\Delta R^2 = .14$ from Model 1 to Model 2 ($p < .01$), .14 from Model 1 to Model 3 ($p < .05$), and .09 from Model 3 to Model 4 ($p < .01$)

Team D-A fit and team performance

I expected that teams that have good D-A fit will also present fair performance in Hypothesis 4. As can be seen in Model 2 in Table 4, team D-A fit was positively related with team performance ($\beta = .56$, $t = 3.02$, $p < .01$), thus supporting Hypothesis 4.

Test of the integrative model: mediation of team D-A fit on diversity—performance

Thus far, the research model of this study suggested that (1) team member diversities are positively related to team D-A fit (Hypotheses 1a, 1b, and 1c) and (2) team D-A fit is positively related to team performance (Hypothesis 4). Taken together, these relationships suggest that the indirect (i.e., the mediated) effect of team member heterogeneities (function, role and cognitive style) on team performance via team D-A fit might exist. In addition, considering the test results of Hypothesis 2, and 3, there is possibility that moderation effects of team need for cognition and task routineness extend to the team performances. In what follows, I additionally examine these possible indirect effects.

I first tested mediation effect of team D-A fit, following Baron and Kenny's (1986) procedures as a basic step. In Model 3 of Table 3, role diversity (positive relation) and cognitive diversity (negative relation) were significantly related to team D-A fit. In Model 3 of Table 4, these variables were also related to team performance in

the same directions they had with team D-A fit (in Model 3 of Table 3). But these diversity variables lost significance when team D-A fit was included as a predictor in Model 4 of Table 4. Hence, this implies the full mediation of team D-A fit on the positive role diversity—team performance and negative cognitive diversity—team performance relationships (Baron & Kenny, 1986).

To further validate the mediation effects, I tested the indirect effects following MacKinnon, Fritz, Williams, and Lockwood (2007). According to MacKinnon et al. (2007), PRODCLIN (distribution of the PRODuct Confidence Limits for INdirect effects) program computes confidence limits for the product of two normal random variables. And it generates accurate confidence limits for the indirect effect linking the two, as demonstrated in several articles (MacKinnon, Lockwood, & Williams, 2004; Pituch, Whittaker, & Stapleton, 2005). I ran PRDCLIN with the parameters attained from bootstrapping (1000 iterations) in accordance with recommendation of Preacher, Rucker, and Hayes (2007) that bootstrapping based on resampling is a robust strategy for assessing indirect effects. The results confirmed the indirect effects of role and cognitive diversity on team performance via team D-A fit (role diversity: 95% confidence interval CI = [0.01, 0.10], not containing zero; cognitive diversity: cognitive diversity: 95% confidence interval CI = [-0.10, -0.01], not containing zero).

Although mediation test results indicated that there is no coherent effect of functional diversity on team performance via team D-A fit, I additionally tested whether the indirect effects of functional diversity are moderated by team need for cognition and

task routineness, considering the significant interaction effects of functional diversity and two moderators presented in Model 4 of Table 3. PROCESS is a computational program tool for a variety of path analysis-based moderation and mediation models as well as their combination as a "conditional process model" (Hayes, 2012). PROCESS can offer bootstrap confidence intervals for conditional and unconditional indirect effects. It covers Edwards and Lambert (2007)'s path analysis approach, which test unconditional and conditional indirect and total effects of a predictor. As can be seen in Table 5, the indirect effects of functional diversity on team performance are moderated by team need for cognition. When a team has low need for cognition, functional diversity seems to harm team D-A fit and subsequently damage team performance. Contrarily, teams with high need for cognition appear to relish positive effect of functional diversity on team D-A fit and team performance.

Table 5

Moderation on Indirect Effects of Functional Diversity

Moderator	**Indirect effect**				**Indirect effect of interaction**			
variable	**effect**	**s.e.**	**llci**	**upci**	**effect**	**se**	**llci**	**upci**
team need for cognition								
low	-.36	.28	-1.34	-0.01				
high	.23	.23	0.01	0.92				
interaction with functional diversity					.30	.23	0.01	1.07
task routineness								
low	-.14	.25	-1.36	0.08				
high	.00	.24	-0.81	0.32				
interaction with functional diversity					.07	.21	-0.24	0.5

Note. $N = 44$. * $p < .05$. llci = lower limit of 95% confidence interval. upci = upper limit of 95% confidence interval. Indirect effects were calculated with parameters extracted from 1000 iterations of bootstrapping.

Discussion

My primary objective for this study was to understand whether, how, and when the diversity that a team member forms with other team members affects the general effectiveness of the team. Using social complex adaptive system as the predominant theoretical lens, I proposed team D-A fit as the mediating mechanism between member diversities such as functional, role, and cognitive heterogeneity. In addition, I addressed team need for cognition and task routineness as the boundary condition for the influences of diversities on team D-A fit. The results of this study generate several points to be discussed.

Interpretation of Results

I expected that member heterogeneities would enhance team D-A fit by stimulating adaptive capacity of the team. However, the results imply that the situation is not that simple. Rather, it seems that the existence of diversities is the necessary condition for the good D-A fit but not the sufficient condition. Specifically, functional diversity was not significantly related to team D-A fit and team performance. Furthermore, cognitive diversity was negatively related to team D-A fit and team performance as opposed to the expectation. Yet their null or negative influence turned

positive when appropriate contingencies are in effect. As noted above, functional diversity was positively related to team D-A fit and team performance only when team members take risks of ambiguities and enjoy solving complex problems (i.e. high team need for cognition condition). And cognitive diversity was also positively related to team D-A fit in teams in teams with high need for cognition level. I assume that these results indicate the importance of social interaction quality. Of course, diversities are essential for the generation of variation that is needed for a complex system to evolve. Yet it does not mean that being different directly leads to explosion of experiments. Rather, experiments and creation of knowledge can be done effectively only when members of the system share information actively and hold trust and mental connections with other members firmly. Social interaction is very important in creating collective knowledge from heterogeneous individuals. Nonaka (1994) stressed the importance of social interaction and derived information sharing in creating organizational knowledge, saying that:

> *Although ideas are formed in the minds of individuals, interaction between individuals typically plays a critical role in developing these ideas. That is to say, "communities of interaction" contribute to the amplification and development of new knowledge. While these communities might span departmental or indeed organizational boundaries, the point to note is that they define a further dimension*

to organizational knowledge creation, which is associated with the extent of social interaction between individuals that share and develop knowledge.

Unfortunately, however, people generally feel reluctant in exchanging information with different others. Prior research suggests that group members are less willing to share information with individuals they perceive to be different from themselves (Devine, 1999; Mesmer-Magnus & DeChurch, 2009; Miranda & Saunders, 2003; Stasser et al., 1995). To overcome such psychological liabilities, mechanisms that can alleviate the feeling of different should be introduced. For instance, in a research that studied the relationship between team cognitive diversity and creativity, team cognitive diversity was not significantly related to creativity (Shin, Kim, Lee, & Bian, 2012). Yet the effects became positive when the leader showed transformational style, which encourages being different and innovative. In this case, a specific leadership style prevented the negative impact of being different. Team need for cognition serves as one of such alleviating mechanisms as well. In teams with high mean need for cognition, individuals tend to relatively easily accept the difference of others and actively, elaborately, and persuasively contribute their perspectives in team discussions (Kearney et al., 2009).

Team cohesiveness and trust can be another solution. Uzzi and Spiro (2005) stated that

> *The more a network exhibits characteristics of a small world, the more connected actors are to each other and connected by persons who know each other well through past collaborations or through having had past collaborations with common third parties. These conditions enable the creative material in separate clusters to circulate to other clusters as well as to gain the kind of credibility that unfamiliar material needs to be regarded as valuable in new contexts, thereby increasing the prospect that the novel material from one cluster can be productively used by other members.*

In sum, although the organization, which inherently favors exploitation of the current solution packages, needs diversities to make variations for adaptability, additional coordinating mechanism should be introduced to deal with back fire of member heterogeneity. In this sense, the positive effects of role diversity need to be specially mentioned.

Unlike functional diversity and cognitive diversity, role diversity showed consistent positive effects on team D-A fit regardless of contingencies. I suggest that this is because role diversities by definition include the notion of harmony in social interaction and behavioral expression of it. As mentioned earlier, a role is defined as a

set of *behaviors* that are interrelated with the repetitive activities of others and characteristic of the person in a particular setting (Biddle, 1979; Forsyth, 1990; Katz & Kahn, 1978). From this definition, roles represent patterns of individual behavior resulting from interaction with other team members. Roles thus reflect consistent patterns of behavior at the individual level, and role composition reflects collective interaction at the team level (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999). So in this regards, needs for additional transition process from diversity as a potential to behaviors in an actualized form are relatively weak when it comes to role diversity. In addition, roles are inherently complementary. According to Mumford, Van Iddekinge, Morgeson, and Campion (2008) diverse roles are necessary for "effective internal execution of the team's work, effective management of the team's relationship with its environment, and preservation of the team's vitality through meeting the social needs of its members (Hackman, 1987; McGrath, 1984; Sundstrom, De Meuse, & Futrell, 1990)." According to Humphrey and his colleagues (2007), role differentiation in a group is main path in which complementarity is actualized. In this regard, it is understandable that role diversity was often called role balance (Belbin, 1993).

A result that is most surprising and difficult to interpret is the interaction of role diversity and team need for cognition on team D-A fit. The relationship between role diversity and team D-A fit turned negative as team need for cognition increased. This was the opposite of my prediction that the positive relationship will be strengthened under high need for cognition as in the cases of functional diversity and cognitive

diversity. Although it is very difficult to interpret the opposite result, the results can be understood through a lens of ambivalent effects of deliberate control of behaviors. When people are doing things they are good at or doing in a very supportive situation, doing without deliberation often enhances the performance. Without unnecessary invading thoughts and change of way of working, they can let out their potential fully. Similarly, when a basketball team is in a high mood and has enough talents in it, just riding the flow can be a good option because the intervention of coach with a timeout might harm the performance of the team, cutting the flow. Teams that have role diversity are like a basketball team in a good balance. As noted above, diversity in roles generally indicates balance in teams unlike diversities of function and cognitive style. A team role is related with employees' natural personality traits according to Mumford et al. (2007)'s results. It is not assigned by formal hierarchy but opted by innate preference of the employee. From this perspective, teams with role diversity can be understood as a very lucky system that happens to have a variety of resources (diversity) with which comparative advantage can be pursued voluntarily (because an informal role represents natural type of the person, which was not assigned by others). In this system, team members voluntarily interact and transact with each other in terms of workloads, and types of work. This situation is like a brisk free market. Even in this situation, however, team members with high need for cognition can try new ways of working and unfamiliar set of behaviors. Although these new attempts stimulated the clogged circulation of unseen resources of functional diversity and cognitive diversity, in the

case of teams with diverse roles, they might serve as mere turbulence that makes the team deviate from the balance at least in the short-term. An employee with high need for cognition might try to take tasks or work procedures that he or she is naturally unfit as a new attempt. If the employee belonged to a team with naturally balanced roles, his or her change is very likely to turn out to produce poor results. That is to say, team need for cognition helps teams get out of the current box but the box might have been very balanced in terms of D-A fit in the case of teams with role diversity. The results of this study regarding moderation of team need for cognition on the role diversity—team D-A fit relationship might represent the deviation from the natural balance. Yet I guess that the effects of team need for cognition could differ in the long-term perspective. However the current state is good, there is no guarantee that the present one is the optimal option. Yet it is still uncertain how long span of time makes the long-term. This is the point where future research is needed.

Theoretical Implications

The first major implication of the findings is that team composition measures (function, role, and cognitive style diversity) were related to the team D-A fit. Prior research mainly dealt with D-A fit in a lens of dyadic relationship between single person and the team. Yet this study presented that the whole team composition can have significant meanings for the fit between members and team. Actually, addressing work

teams, most researchers have taken an isomorphic approach (Kozlowski & Klein, 2000) by simply using the mean level of team members' traits not considering composition or other collective features of the team. That is an unbalanced attempt, however, which is very likely to fail to grasp the whole picture of team activities. Isomorphic approach generally overlooks emergent features of group of people. Although a research on traits at the individual level may be able to explain and predict how individual team members perform individual tasks, this very research may be inappropriate for examining how team members engage in teamwork (the interactive behaviors within the team; McIntyre & Salas, 1995) and affect each other serving as a critical contextual factor themselves. As a famous adage says, the whole is more than the sum of its parts. Team members can perform their individual responsibilities competently, but still be as much uncoordinated with the rest of the team, and consequently ineffective in light of team performance. In this sense, even when individual level or team level index, which were derived by averaging individual level attributes, is quite desirable, it is possible that the index does not represent reality of the team sufficiently.

Secondly, this study gives the evidence of the relationship between fit and team composition. Although most studies that dealt with team composition did not consciously draw on person-team fit (P-T fit) framework, their results can be complemented or more consistently understood through the lens of P-T fit theory. Acknowledging the need for studying individual difference configuration in work teams, mainly the relational demography literature has offered strong evidence that an

employee perception of demographic dissimilarity from other team members influences his or her work attitudes and organizational behaviors (Riordan & Shore, 1997; Tsui, Egan & O'Reilly, 1992). Yet, some researchers (Harrison, Price & Bell, 1998; Harrison, Price, Gavin & Florey 2002; Kristof-Brown et al., 2005) suggested that while demographic differences are important, it is time for research to begin examining the more deep psychological characteristics of work team members and deepen the understanding on the specific mechanism in which team configuration operates. One area of research domain that can be useful in the thorough examination of team context and configuration is person environment fit (P-E fit) literature (Kristof-Brown et al. 2005). In addition, P-T fit literature, which suffers from scarcity of empirical supports, too would be able to get insights from achievements from team composition literature as well. Surprisingly few studies have researched antecedents or consequences of this type of fit. According to Kristof (1996), the academic stream most closely related to P-T fit is that of team composition based on diversity literature. Answering the call, this study empirically links fit and composition.

Most important theoretical implication this study has is adopting complex adaptive system approach and giving some evidence of it. In the introductory note for a special issue of *Management Science*, Amaral and Uzzi (2007) urged the adoption of complex science into the management field, stating that

> *In management contexts, complex systems arise whenever there are*

> *populations of interacting agents (persons, organizations, or communities) that act on their limited and local information. … As such, complex system[s] are representative of a wide range of management problems that involve specialists who must combine their individual and deep expertise into a whole. These specialists only have limited local knowledge within an environment where rules for the planned interactions are impossible because leaders lack the necessary knowledge they need to prescribe an optimal structure or because imposing a structure would stifle individual initiative and creativity.*

In this study, D-A fit was hypothesized to be enhanced by evolutionary process, which involves variation, selection, and replication, provided work teams are complex systems as Amaral and Uzzi said. In specific, since organizations and teams are inherently weak in generating variations, I postulated that diversities in member composition should exist to revitalize the teams' capacity to make variations. While testing my hypotheses, I found some supports that member diversities are significantly related to team D-A fit and team performance. These results, however, does not guarantee that the significant statistics or numbers in tables really represent the actual influence of complexity and evolutionary process. Yet one results shed lights. As mentioned in the results part, task routineness was basically negatively related to team

D-A fit and functional and role diversity was beneficial for the team D-A fit when task routineness was high. Prior research mainly stated that high diversity is beneficial under non-routine or instable situations and low diversity is beneficial under routine situations. Hence, according to prior research, my results look nonsensical. Yet I posit that it is nonsensical only from the static perspective. It would be true that the value of diversity is higher under complex, uncertain situations. The problem is that an agent cannot judge the situation exactly whether it is stable or unstable because the person "only have limited local knowledge within an environment where rules for the planned interactions are impossible. (Amaral & Uzzi, 2007)" Even when tasks are routine, a team is a complex adaptive system as long as multiple agents interact and the team is located in a larger system. My test results do not indicate that routine situation requires diversity. Rather, the results point out the gap between perception of people and the real complex systematic process a team undergoes. That is, when people don't feel urgent need to explore variations as under routine task situations, they are likely to neglect possible better options and consequently remain under-optimal process. And adding some diversity exerts the positive effect because it makes up for the limited capacity or desire of adaptation, which is still needed regardless of perceived task routineness.

Managerial Implications

As noted above, addressing team characteristics or contexts, most researchers

have taken an isomorphic approach (Kozlowski & Klein, 2000) by simply using the mean level of team members' traits. This isomorphic conceptualization implicitly (and often not recognized by researchers themselves) assumes that teams can be formulated with almost unlimited pool of talents from which employers can acquire any type and level of human resources. But it is often very difficult to attain needed types of employees from either external labor market or internal labor market (i.e. the organization concerned) even when managers explicitly recognize the employee attributes that are currently needed.

In other words, even if isomorphism is valid, it is still critical to consider placement decisions when building teams. Placement decisions refer to the following question: given a population of employees, how are organizational members allocated to teams (Humphrey et al., 2007)? Consider an organization that selected the top 100 people regarding cognitive ability from a pool of job applicants. To compose 20 teams from these people, the organization can place the top 5 scorers in team 1, the next 5 in the 2nd team, and so on (creating within team homogeneity), or put the top 20 scorers in 20 different teams, placing the next 20 individuals into the 20 teams in the opposite order of the previous round, and so on (creating within team heterogeneity). If these distinct configurations of individual traits have substantial impact on team effectiveness, placement decisions become highly important for future team performance.

The results of this study imply that teams need to be composed in a way that instill diversity in terms of experience (function), behavioral pattern (role), and

schemata (cognitive style). But building heterogeneous teams is not enough. Managers should consider additional mechanisms that will alleviate the side-effects of diversity, reluctance to exchanging information and taking risks for the team. Trust and team cohesiveness are badly needed to put evolution of teams on track.

In principle, most important is for managers to recognize the complex nature of organizations and teams. Admitting the limit of expectation capacity, they could build organizational climate that is appropriate for the free discussion and active experiments. And sometimes failure needs to be rewarded because it expands the scope of search as well as other tries that succeeded. Effective teams form naturally if there is a process of evolutionary selection of teams that operate well in complex systems.

Limitations and Directions for Future Research

There are several limitations of the current study. First of all, I measured much portion of variables using self-report methodology. I recognize that there is a possibility of method variance and this may have biased the result (Spector, 2006). Yet confirmatory factor analysis showed that the amount of common method variance occupied 18% of total variance in self-reported variables. This is smaller than the average of published studies (Perry, Witt, Penny, & Atwater, 2010; Williams et al., 1989).

Second limitation of this study is that the research model lacks specific

construct that measures the extent to which teams conduct experiment or explore. Although the focus of this study was the relationship of diversities and team D-A fit, the study would give more detailed description of evolutionary process in teams if it included construct such as exploration and problem to generated solution ratio.

Third limitation is that the time span of the research was too short to capture the full process of team adaptation. Evolution of complex system can be understood fully only when it is observed for a very long span of time. With a cross-sectional data, I could not get but only snapshots of complex team change. To further validate the research, the relationships between constructs should be studied across a time band that covers at least a few cycles of punctuated equilibrium (combinations of relatively long and stable periods with intermittent and abrupt adversities). In addition, I cannot assure the exact causality on how the independent variables affect team D-A fit or team performance. Longitudinal studies should be conducted in the future to verify the causal relationship that may exists among the variables.

Forth limitation is the restriction of cultural context. All the data I have used in the analyses were from companies in South Korea. Considering the cultural influences, the replications in other countries are strongly recommended.

There can be several future researches that will supplement the present study. Firstly, individual level D-A fit and individual performances can be added to the model. In this study, I posited that team has an emergent feature and consequently come to have complex characteristics. If individual constructs are included and team D-A fit and team

performance are proved or disproved to have unique and greater effects beyond individual isomorphic variables, the tenet that teams are complex adaptive system can be tested more conservatively.

Secondly, needs-supplies fit (N-S fit) can be included as well as D-A fit. In this study, I mainly focused on the effects of diversity on teams as a whole and interpreted the effects from the teams' perspective. Yet it will be also valuable to address those effects from the point of view of individuals. According to Kristof (1996), complementary fit concept can be integrated with the needs-supplies and demands-abilities fit distinction. From the needs-supplies perspective, fit arises when an environments offers physical or socio-emotional resources that satisfy individuals' needs, desires, or preferences. Until recently, although these N-S and D-A distinction has been discussed frequently by independent researchers, they have rarely been integrated theoretically and empirically in one comprehensive perspective (Cable & De Rue, 2004; Kristof, 1996). As adaptation of individuals plays considerable roles in the evolution of complex systems, it would be beneficial to consider individual N-S fit as well.

Thirdly, network-approach will enhance the methodological robustness of the model greatly and allow for questions on much broader aspects of the world as a complex system we live in. In this study, complexity of the system was not assessed directly. If the actual complexity in and around teams can be evaluated via network analysis and compared to the subjective perception of team members such as task routineness, negligence of people about complexities and over-optimism could be tested.

Once the existence of such negligence is proved, studies testing moderating effects that alleviate the side-effects of such carelessness on complexity will become possible as well.

Conclusion

This research offered empirical support that member diversities in function, role, and cognitive style exert complementary influence on team effectiveness via team D-A fit with complex system approach as the predominant theoretical lens to integrate diversity and fit research. Meanwhile, I expanded the streams of study by suggesting the need to consider boundary conditions of actualization of positive potential that team member diversities have. Specifically, team need for cognition and task routineness generally strengthened the impact of diversities and made member heterogeneities affect team D-A fit and team performance in complementary manner. I hope the current study will stimulate future research endeavors to advance our understanding of teams and organizations as complex adaptive systems.

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초 록

보완성 유형이 팀-구성원간 요구-능력 적합성과 팀성과에 미치는 영향

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김상윤

본 연구에서는, 팀 구성원의 기능, 역할, 인식 다양성이 요구-능력 적합성을 거쳐 팀 효과성에 보완적이고 긍정적인 영향을 미친다고 가정한 후, 이를 실증적으로 확인하여 본다. 또한 복잡계적 접근을 활용하여 다양성 연구와 적합성 연구의 접합점을 찾으려 시도한다. 위에 언급한 다양성의 주 효과에 더하여 인지욕구와 과업일상성이 가지는 조절효과도 함께 살펴본다. 구체적으로는, 인지욕구와 과업일상성은 다양성이 팀의 요구 능력 적합성과 가지는 정적 관계를 강화시킬 것으로 예상하였다.

44개 팀으로부터의 데이터를 활용하여 검증한 결과, 역할 다양성이 요구능력적합성을 거쳐 팀 성과와 정적 관계를 가짐을 확인하였다. 그러나 인식 다양성은 예상과 반대로 팀 적합성, 팀 성과와 부적인 관계를 맺는 것으로 나타났다. 기능 다양성에 있어서는, 비록 주 효과는 나타나지 않았으나 인지욕구가 큰 팀에 있어서 요구 능력 적합성을 거쳐 팀 성과와 정적 관계를 맺는 것으로 보인다. 인지욕구와 과업일상성의 조절효과는 전반적으로 지지되었다. 기능다양성과 인지다양성은 인지욕구가 강한 팀의

경우에 요구 능력 적합성과 정적 관계를 가진다. 그리고 과업일상성이 높을 때, 기능다양성과 역할다양성이 팀 적합성과 팀 성과에 있어 역시 정적 관계를 지니는 것으로 나타났다. 하지만 예상과 반대로 역할 다양성의 경우 인지경우가 높을 때 오히려 요구–능력 적합성과 부적관계를 보였다.

주요어 : 다양성, 요구–능력 적합성, 인지욕구, 과업일상성, 팀성과, 복잡적응시스템

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