

ABSTRACT

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TEAMS: AN INSTITUTIONAL APPROACH

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Multidisciplinary teams, of which members are from different knowledge domains or disciplines, have been studied mostly in the context of cognitive diversity. However, diversity-focused approach may be missing some potential barriers to successful performance of individuals in multidisciplinary teams. Relying on institutional theory for a theoretical framework, I conceptualize two of such barriers: *disciplinary embeddedness*, or the extent to which an individual is cognitively, affectively and normatively influenced by her discipline, and *disciplinary hierarchy*, or the degree of perceived status differences among disciplines in the team. Further, I develop a multilevel model of their effects on team member performance in multidisciplinary teams. In the model, it is proposed that individual voice behavior and openness to voice may mediate the negative effects of the two barriers. In addition, I suggest that individual commitment to the team and team leader attributes such as disciplinary background breadth and transformational leadership may mitigate these negative effects. I test the proposed model using a data set from 138 team members in 23 multidisciplinary research teams at a large national research institute in South Korea. I find that disciplinary embeddedness and hierarchy indeed interrupt with team member performance. Additionally, openness to voice and voice behavior are found to be a mediator for the effect of disciplinary embeddedness and hierarchy, respectively. Leader disciplinary background breadth weakens the negative effect of disciplinary hierarchy on voice behavior.

REDEFINING MULTIDISCIPLINARY TEAMS: AN INSTITUTIONAL APPROACH

by

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Dedication

I dedicate my dissertation to my husband, Sangbeom and our son, Woojin. Sangbeom, your unconditional support has made me stronger. Woojin, you have given me pure love and delight. I cannot say that you guys have never distracted me from my study. However, those happy distractions with you protected me from exhaustion and made my life truly meaningful.

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Table of Contents

List of Tables	v
List of Figures	vi
Chapter 1: Introduction	1
Chapter 2: Literature Review	7
<i>Section 1: Past Research on Multidisciplinary Teams</i>	7
<i>Section 2: Redefining Multidisciplinary Teams as Multi-institutional Teams</i>	10
<i>Section 3: Team Leaders as Institutional Entrepreneurs</i>	22
<i>Section 4: Team Commitment</i>	24
Chapter 3: Theory and Hypotheses	26
<i>Section 1: The Negative Effects of Disciplinary Embeddedness</i>	26
<i>Section 2: The Negative Effects of Disciplinary Hierarchy</i>	28
<i>Section 3: The Moderating Effects of Team Leadership</i>	31
<i>Section 4: The Moderating Effects of Team Commitment</i>	35
Chapter 4: Research Methodology	37
<i>Sample and Data Collection Procedure</i>	37
<i>Measures</i>	38
<i>Aggregation Statistics</i>	46
<i>Analytic Strategy</i>	47
Chapter 5: Results	49
<i>Main and Mediating Effects</i>	49
<i>Moderating Effects</i>	51
<i>Additional Analyses</i>	53
Chapter 6: Discussion	55
<i>Theoretical Implications</i>	55
<i>Practical Implications</i>	63
<i>Limitations and Future Research Directions</i>	64
<i>Conclusion</i>	67
Tables and Figures	68
Appendix	74
References	77

List of Tables

Table 1. *Descriptive Statistics and Correlations for Individual-level Variables*

Table 2. *Results of HLM Analyses for the Main and the Mediating Effects*

Table 3. *Results of HLM Analyses for the Moderating Effects*

Table 4. *Results of HLM Analyses for the Effects of Disciplinary Status*

List of Figures

Figure 1. Proposed research model

Figure 2. The moderating effect of leader disciplinary background breadth on the hierarchy-voice relationship

Chapter 1: Introduction

As cutting-edge technologies require coordination of diverse knowledge and information, numerous organizations have incorporated teams of which members represent different knowledge domains, or *multidisciplinary teams*, in order to acquire technological leadership (Jackson, 1996; Van der Vegt & Bunderson, 2005). Some examples of a multidisciplinary team include a cross-functional team that consists of marketers, accountants, engineers and designers (e.g., Ancona & Caldwell, 1992), a research team where scientists from various disciplines collaborate (e.g., Dobbs, 1987; O'Connor, Rice, Peters, & Veryzer, 2003; Van der Vegt & Bunderson, 2005), and a medical team where physicians with different specialties work together (e.g., McAlister, Stewart, Ferrua, & McMurray, 2004). The most distinguishing feature of this type of teams, by definition, is that cognitive resources required for team task are distributed across team members. In such teams, team task is typically accomplished in an itinerative way; each component of the task is assorted and assigned to individual team member or members who possess a unique set of skills, knowledge and expertise that are necessary for the component. Although the task is segmented, each member should continuously exchange information and ideas with one another because, at the end, all the components are to be integrated and combined at the team level. This whole process of integration and combination of diverse cognitive resources inevitably involves back-and-forth communication and collaboration between individuals or disciplines (Pinto, Pinto, & Prescott, 1993). Therefore, it is critical for each and every team member to actively cooperate with others and make sufficient contributions to team task, especially in such teams. In other words, successful functioning of multidisciplinary teams is bound to be dependent on performance of individual team member more highly than in unidisciplinary teams where members can substitute for one another to some extent.

However, academic investigation on *team member performance*, or individual team member's contribution to team task, in such teams has been scarce. In the previous management literature, multidisciplinary teams have been studied mainly in the area of diversity as a type of cognitive diversity (Jackson, 1996; Mannix & Neale, 2005; van Knippenberg, De Dreu, & Homan, 2004; van Knippenberg & Schippers, 2007). Studies on cognitive diversity (i.e., multidisciplinary teams with such diversity) have mostly focused on team-level processes and outcomes assuming that diverse cognitive resources in such teams benefit team decision making and innovation (e.g., Dahlin, Weingart, & Hinds, 2005; Homan, Van Knippenberg, Van Kleef, & De Dreu, 2007; Keller, 2001; Van der Vegt & Bunderson, 2005). Considering that team member performance plays a part like a piece of a jigsaw puzzle in functioning of multidisciplinary teams, focusing only on team-level processes and outcomes while ignoring individual-level processes and outcomes is a serious problem in investigating such teams (Williams & O'Reilly, 1998; see Randel and Jaussi (2003) for a rare exception). Thus, my dissertation study starts with a simple question; in multidisciplinary teams, what interferes with or promotes team member performance and how?

Scholars in other academic fields such as science and technology, and medicine where multidisciplinary collaboration is prevalent provide some hints for this question. The first difficulty that they have long recognized working in multidisciplinary teams is the fact that each team member is deeply rooted or embedded in one's own discipline in cognitive, affective and normative aspects, which is called individual *disciplinary embeddedness* in this study. Team members from different knowledge domains are distinguished not only in their cognitive resources but also in meta-cognition such as cognitive schemes, thought processes and worldviews (O'Connor et al., 2003; Roederer, 1988; Stokols, Hall, Taylor, & Moser, 2008;

Younglove-Webb, Thurow, Abdalla, & Gray, 1999). For example, Roederer (1988) described it as; “they use different customs; speak different scientific dialects or lingos; use different approaches in research --even their ways of rationalizing may be different (p. 661).” Such meta-cognitive differences make it difficult for a team member to fully understand and communicate with other members in multidisciplinary teams (Cronin & Weingart, 2007; Dougherty, 1992). In addition, individuals who are deeply immersed in their discipline strongly identify themselves with the discipline, which may in turn lead them less cooperative to the team as the collective goals of the team is less important to them (Randel & Jaussi, 2003; Younglove-Webb et al., 1999). Such scholars have also reported that members of multidisciplinary teams typically care too much about performance criteria and norms of their discipline and it hinders them from actively collaborating with one another as a team. For example, Dobbs (1987) described that professionals sometimes are reluctant to learn from professionals from other disciplines and to use different methods and techniques than their own as their disciplinary peers would consider such multidisciplinary work as a kind of “compromise” in a negative sense.

The second barrier that scholars in other academic fields have noticed is differences in status across disciplines in a multidisciplinary team, which is called *disciplinary hierarchy* in this study. For example, multidisciplinary research in agricultural economics is often ineffective because economists and natural scientists tend to consider each other “parasitic” and look at each other contemptuously (Dobbs, 1987). More remarkable examples come from multidisciplinary medical teams. Cott (1997) observed that multidisciplinary medical teams are likely to develop sub-teams based on disciplines, and a strong perceived hierarchy exists between the sub-teams – that is, a professional sub-team and a nursing sub-team. Although it is apparent that medical teams can benefit from diverse viewpoints and expertise of both disciplines, nursing sub-teams

were excluded from decision-making and problem-solving and engaged solely in “mechanistic” work due to perceived hierarchy between the disciplines (Cott, 1997, 1998). It is not difficult to imagine similar phenomena happening in multidisciplinary teams in non-medical settings. For example, a multifunctional top management team in a diversified company follows the dominant logic of the largest business section that provides the driving power for the firm’s growth and success (Prahalad & Bettis, 1986). In this regard, reviewing the previous literature on multidisciplinary teams, Jackson (1996) asserted that the effect of status differences across disciplines on multidisciplinary teams deserves academic attention.

In sum, disciplinary embeddedness and hierarchy have been observed to be one of the main difficulties or barriers interfering with professionals to make sufficient contributions to multidisciplinary teams. A critical limitation of the management literature on multidisciplinary teams is that these two potential barriers have not been fully theorized and examined, although their negative effects on team member performance are deemed as an empirical fact in other academic fields. Therefore, the purpose of my dissertation is threefold. First, it aims at conceptualizing these two barriers. In doing so and further developing my research model, I rely on institutional theory (Scott, 2001; Zucker, 1987) as an overarching theoretical framework. Although institutional theory has been studied mostly in relation with macro, but rarely with micro, levels of organizational entities including organizations, industries and nations (Powell & Colyvas, 2008), I choose the theory for theoretical guidance as the two barriers mentioned above are closely related to its basic premises. From the viewpoint of institutional theory, multidisciplinary teams are multi-institutional teams where each team member is highly embedded in one’ disciplinary background, and various disciplines compete and conflict with one another for status and power (Benson, 1977; DiMaggio & Powell, 1983; Seo & Creed, 2002).

In addition, institutional theory assumes that inherent disciplinary embeddedness and disciplinary hierarchy strongly influence patterns of interactions among social actors (Benson, 1977; DiMaggio & Powell, 1983; Granovetter, 1985). This discussion implies that institutional theory can provide a powerful and parsimonious theoretical framework that explains the two phenomena of interest and offers insightful addition to our current understanding on multidisciplinary teams.

The second purpose of my dissertation is to explain why the two barriers, disciplinary embeddedness and hierarchy, influence individual contribution to the team. Specifically, I identify the mediating mechanisms through which disciplinary embeddedness and hierarchy affect team member performance. The first mediator examined is *individual voice behavior*, or verbal behavior to express challenging and change-oriented messages in order to make an improvement to the team (LePine & Van Dyne, 1998). The second is *openness to voice*, or the extent to which an individual pays enough attention to and evaluate new information, opinions, suggestions and ideas from others fairly (Ashford, Rothbard, Piderit, & Dutton, 1998; Detert & Burris, 2007). I direct my attention to these two mediators because, in a multidisciplinary team where expertise and knowledge are localized and distributed across members and tasks are highly interdependent, it is vital for team members to actively set forth their unique ideas and viewpoints to one another and keep open-minded toward opinions and information from others to perform well (Mesmer-Magnus & DeChurch, 2009; Simons, Pelled, & Smith, 1999).

The final purpose of this study is to discover some remedies to these barriers by finding moderators to reduce their negative effects. According to institutional theory, in cases where different institutions (i.e., disciplines) collide just like in a multidisciplinary team, a leader who can create new institutional logics plays an important role (Beckert, 1999; Maguire, Hardy, &

Lawrence, 2004; Seo & Creed, 2002). In this regard, I focus on the attributes of team leaders that may weaken the negative influences of the barriers. Specifically, I propose that leader's disciplinary background breadth and transformational leadership may mitigate the negative effects. In addition, I examine the moderating effects of team commitment as well. From the perspective of institutional theory, members of a multidisciplinary team can be seen experiencing a micro-level "institutional change" from disciplinary background as an old institution to the multidisciplinary team as a new institution (Seo & Creed, 2002). In such a situation, commitment of participants plays an important role in determining the success of the change (Begley & Czajka, 1993; Iverson, 1996; Lines, 2004; Madsen, Miller, & John, 2005; Seppälä, Lipponen, Bardi, & Pirttilä-Backman, 2012). Hence, individual commitment to the team is examined as another moderator.

The remaining of this paper proceeds as follows; In Chapter 2, I briefly review previous studies on multidisciplinary teams as well as institutional theory, and conceptualize the two barriers discussed above. I also provide a brief review of studies on my mediators and moderators in the model. In Chapter 3, I develop a cross-level model on the effects of these two barriers on team member performance in multidisciplinary teams, providing detailed theoretical reasoning for each relationship in the model. In Chapter 4, I explain the methodology of my research. Chapter 5 describes the findings of the study. Lastly, Chapter 6 provides a discussion of theoretical as well as practical contributions of my dissertation study, and some limitations that offer future research directions.

Chapter 2: Literature Review

Section 1: Past Research on Multidisciplinary Teams

A team is multidisciplinary when its members represent different knowledge domains (i.e., disciplines). One special type of multidisciplinary teams that has been extensively studied in the field of organizational behavior, especially in the teams and diversity literature, is cross-functional teams (Ancona & Caldwell, 1992; Boone & Hendriks, 2009; Bunderson & Sutcliffe, 2002; Gebert, Boerner, & Kearney, 2006; Jehn & Bezrukova, 2004; Randel & Jaussi, 2003; Van der Vegt & Bunderson, 2005). A team is viewed cross-functional when its members have high level of skill differentiation, or they “are part of the team because they bring a unique perspective to the work that would be missing without them (Hollenbeck, Beersma, & Schouten, 2012, p.94).” In this sense, cross-functional teams share the very essence of multidisciplinary teams. However, a cross-functional team typically has temporary membership and its members simultaneously belong to multiple functional subunits throughout the organization (Denison, Hart, & Kahn, 1996). It usually is “designed as an overlay to an existing functional organization (p. 1005).” All of these attributes other types of multidisciplinary teams do not necessarily have. In this regard, it would be reasonable to view a multidisciplinary team as a broader concept that includes a cross-functional team.

Management scholars have studied multidisciplinary teams mostly through the lens of diversity. Studies on team diversity have classified diversity into two categories: demographic and cognitive diversity (Mannix & Neale, 2005; van Knippenberg & Schippers, 2007). Demographic diversity, or diversity in social categories such as race, gender and age, has been assumed to harm team functioning because such diversity provokes intergroup biases. This perspective is based on social identity theory (Ashforth & Mael, 1989; Tajfel & Turner, 1986;

Turner, Sachdev, & Hogg, 1983). On the other hand, cognitive diversity, or diversity in members' educational or functional background, information or expertise, has long been assumed to benefit a team because it allows integration of diverse information, skills and knowledge from team members and even from the outside of the team (Ancona & Caldwell, 1992; Dahlin et al., 2005; Homan et al., 2007; Mannix & Neale, 2005; Simons et al., 1999; Van der Vegt & Bunderson, 2005; van Knippenberg et al., 2004; van Knippenberg & Schippers, 2007). This is called as information-processing and problem solving approach (Mannix & Neale, 2005; van Knippenberg et al., 2004). Studies on cognitively diverse teams (e.g., multidisciplinary teams) have mainly investigated how cognitive diversity influence team-level processes and outcomes (e.g., Dahlin et al., 2005; Homan et al., 2007; Keller, 2001; Van der Vegt & Bunderson, 2005). Interestingly, unlike the assumption that cognitive diversity benefits teams, notably many studies have found that teams with cognitive diversity do not perform well as expected. Rather, they are easily entrapped with conflicts among team members and produce disappointing outcomes (Ancona & Caldwell, 1992; Lovelace, Shapiro, & Weingart, 2001; Pelled, Eisenhardt, & Xin, 1999). This raises a question of *why* it is so difficult for cognitively diverse teams to perform successfully. I believe that this question can be answered at least partly by investigating antecedents that damage or promote individual performance of team members. As discussed in Chapter 1, performance of a multidisciplinary team as a whole is highly dependent on individual participation and contribution of each and every team member, due to its high level of cognitive diversity. Therefore, finding what makes it difficult (or easy) for an individual member to successfully engage in desirable behavior and perform well as a part of a team can eventually help such teams function better as a whole.

Fortunately, a small number of recent studies on multidisciplinary teams have provided some insight for identifying barriers to team members' individual performance (i.e., team member performance). One type of problems identified so far is cognitive incompatibilities among members of multidisciplinary teams. As disciplines are rooted in different knowledge domains and have dissimilar beliefs in what is considered desirable, the way how team members comprehend and define "problems" on the team vary across disciplines. Different representations and interpretations of problems result in different approaches and solutions to the problems, which interferes with smooth coordination and cooperation among team members (Cronin & Weingart, 2002). In addition, different cognitive background means lack of understanding on mental models of other team members from different disciplines. Hence, team members cannot communicate with one another in an effective and efficient way (Huber & Lewis, 2010). Another problem of multidisciplinary teams that has been recently found is individual identification with her disciplinary background. Randel and Jaussi (2003) found that the more a member of a multidisciplinary team identified with her disciplinary background, the worse her performance became.

In addition, although it has not been properly studied in the management literature on multidisciplinary teams, Jackson (1996) pointed out that status differences across disciplines could influence individual behavior in multidisciplinary teams (Jackson, 1996). People in work groups tend to perceive status differences almost automatically even with cues that are not directly related to task performance (Ridgeway, 1987; Ridgeway, Boyle, Kuipers, & Robinson, 1998; Ridgeway & Diekema, 1989; Ridgeway & Walker, 1995). This means that disciplines could be a source of perceived status differences. Status differentiation in a group powerfully influences individual behavior and interpersonal interaction in many aspects (e.g., Bettencourt,

Charlton, Dorr, & Hume, 2001; Brewer, Manzi, & Shaw, 1993; Martin, Jones, & Callan, 2006). Particularly, it shapes patterns of communication and information sharing among group members (Kirchler & Davis, 1986; Leffler, Gillespie, & Conaty, 1982; Silver, Cohen, & Crutchfield, 1994; Weisband, Schneider, & Connolly, 1995). Considering that these types of behavior are important in knowledge transfer and integration (Argote & Ingram, 2000; Argote, Ingram, Levine, & Moreland, 2000; Bunderson & Sutcliffe, 2002; Faraj & Sproull, 2000; Mesmer-Magnus & DeChurch, 2009), status differentiation across disciplines might play an important role in determining team member performance in multidisciplinary teams.

These studies do provide a meaningful starting point in examining these potential barriers that scholars in other academic areas, especially in science and technology, have observed (Cott, 1997, 1998; Dobbs, 1987; O'Connor et al., 2003; Roederer, 1988; Stokols, Hall, Taylor, & Moser, 2008; Younglove-Webb, Thurow, Abdalla, & Gray, 1999), discussed in Chapter 1. However, they are sporadic in the sense that they do not have a common theoretical framework. I believe that institutional theory provides an overarching theoretical framework in theorizing the phenomena of interest.

Section 2: Redefining Multidisciplinary Teams as Multi-institutional Teams

The basic tenet of institutional approach to organizational phenomena is that “there are enduring elements in social life –institutions– that have a profound effect on the thoughts, feelings and behavior of individual and collective actors (Lawrence & Suddaby, 2006, p. 216).” *Institutions* are defined as “cultured-cognitive, normative and regulative elements that ... provide stability and meaning to social life (Scott, 2001, p. 48).” They “are frameworks of programs or rules establishing identities and activity scripts for such identities” (Jepperson, 1991). They are regulatory and organized patterns of action that reside in formal structures of organizations rather

than in particular organizations or individuals (Zucker, 1987). Some examples of institutions that have been studied in the macro OB field include organizational practices such as compensation (e.g., Eisenhardt, 1988), environmentalism (Hoffman, 1999), and professions such as science and law (Robertson, Scarbrough, & Swan, 2003).

In this regard, a discipline such as physics, computer science, psychology, and history is a type of an institution. It is obvious that each discipline occupies a unique cognitive domain. Although all disciplines generally pursue discovery of scientific fact and knowledge creation, they provide different institutional environment for the purpose. According to Robertson et al. (2003), disciplines provide different influences on knowledge creation in three aspects. First, they have different ways to standardize expertise and professionalize their members. For example, it requires to acquire different knowledge and skills and to take different procedures in order to become, for example, a psychiatrist than to become a computer engineer. Second, disciplines restrict the methods of knowledge creation by having different epistemological approaches. For example, the fundamental goal of natural science is judgments of fact, whereas that of law is judgments of value. Therefore, natural science uses the method of experiment, replication and induction, while law uses deduction and reinterpretation. Halliday (1985) put it that, for example, humanities and social sciences are “philosophically different” from natural science. Thirdly, disciplines produce different professional identities. For example, although both of them deal with people with mental illness, a psychiatrist who has been trained in the area of medicine is likely not to identify herself with a clinical psychologist who has been trained in the area of psychology. They typically use dissimilar techniques and approaches to treat mentally ill people due to different training experiences (Kingsbury, 1987).

Therefore, from the perspective of institutional theory, multidisciplinary teams can be viewed as *multi-institutional* teams. What this means is that a multidisciplinary team creates an environment where different norms, values, viewpoints and logics as well as knowledge and skills from various disciplines collide and conflict with one another. Reconceptualizing multidisciplinary teams as multi-institutional teams gives an important insight in understanding multidisciplinary teams, since the theory provides theoretical explanation for the two barriers, disciplinary embeddedness and disciplinary hierarchy, mentioned earlier.

Disciplinary embeddedness. Institutional theory considers that social actors are *embedded* in institutions. That is, their behavior is influenced and determined by institutions (Granovetter, 1985). Institutions influence behavior of social across in several ways. Institutions restrict or constrain social actors' behavior with norms, provide information that determines what is acceptable and what is not, determine the way of thinking, motivate them by providing goals and even set the tone of affective reactions to external events (Dequech, 2003). Eisenhardt (1988) summarized the reason of strong influence of institutions over individual behavior like below;

Institutionalization occurs in part because people conform to taken-for-granted ways of doing things (Pfeffer, 1982). Such standard ways of doing things allow people to focus on new problems and to rely on experience for issues that are not pressing (Cyert & March, 1963). Moreover, organizational structures and processes become part of an integrated whole in which it is difficult to change any part without unraveling the whole (Clark, 1972). However, these arguments do not imply that institutional choices are necessarily irrational. Rather, the use of structures and processes that are legitimated by an environment can be sensible because it implies responsible management, pleases external others, and avoids potential claims of negligence of something goes wrong (Meyer & Rowan, 1977).

The discussion of embeddedness in institutional theory suggests that professionals in a multidisciplinary team are embedded in their own disciplines, and their behavior is influenced by logics, norms and implicit rules of their disciplines due to their embeddedness. In this regard, I define an individual's *disciplinary embeddedness* as the extent to which the person is cognitively specialized in her own discipline and normatively influenced by its collective norms and values, and identify herself with her disciplinary background. This definition conceptualizes disciplinary embeddedness as a multifaceted construct that includes cognitive, affective and normative influence of institutions (i.e., disciplines). Cognitive influence of institutions has two functions (Dequech, 2003). One is to provide information to the individual, such as the "indication of the likely action of other people (p. 463)." The other cognitive function of institutions is to influence "the very perception that people have of reality, that is, on the way people select, organize and interpret information (p. 463-464)." Therefore, disciplinary influence on individual cognition may be manifested in cognitive schemes, task representations, behavioral scripts, technological language, and worldviews that are distinct from those of other disciplines (Weber & Glynn, 2006). Individuals who are highly embedded in their discipline would be very familiar with and habitually use such schemes, representations and so on in their task-related activities. At the same time, they would feel uncomfortable and even consider "wrong" about such cognitive characteristics of other disciplines.

Affective influence of institutions includes individual identification and commitment to institutions and institutional values and missions (Stryker & Burke, 2000). Reviewing vast literature on sociology-based identity theory, Stryker and Burke (2000) found the root of the concept of affective (or "cultural" in the terminology of institutional theory) influence of institutions in Mead's (1934) framework, which the authors summarized in a formula, "society

shapes self shapes social behavior (Stryker & Burke, 2000, p. 285).” The formula indicates that once individual identification with a certain institution (i.e., discipline) becomes strong and salient among others, the individual comes to feel committed to the institution and internalize its values and esteems, and thus engage in behavior indicated by the institution (Rao, Monin, & Durand, 2003; Stryker & Burke, 2000). In this sense, this function of institutions is motivational and emotional (Dequech, 2003).

Finally, normative influence of institutions involves individual conformity to standards and performance criteria of an institution. This is analogous to organizational conformity, which refers to their change of values, outputs and ways of operations to match social values (Dowling & Pfeffer, 1975). An individual is subject to normative influence of an institution because otherwise he or she would lose *legitimacy*, or perception of others that his or her behavior is desirable and appropriate within a larger society. Since loss of legitimacy gives the individual disadvantage in competition with others, she cannot help but conforming to institutional norms (Suchman, 1995). The normative component of disciplinary embeddedness is conceptually differentiated from normative commitment as a part of organizational commitment. Normative commitment is defined as individual “feelings of obligation to remain with the organization (i.e., the discipline, in the context of my dissertation study, Allen & Meyer, 1990, p. 1).” Normative embeddedness is different from normative commitment to the discipline in the sense that the former regards conformity to disciplinary norms and standards and sensitivity to other professionals’ (who are in the same discipline) reaction to one’s “illegitimate” behavior, rather than belief in one’s responsibility to stay in the discipline.

This multidimensional feature of disciplinary embeddedness differentiates itself from similar constructs such as functional identity (Randel & Jaussi, 2003), professional identity (Pratt,

Rockmann, & Kaufmann, 2006), and professional or occupational commitment (Lee, Carswell, & Allen, 2000; Tangirala & Ramanujam, 2008a). These constructs regard only the one aspect of disciplinary embeddedness, which is the affective component. In other words, disciplinary embeddedness is a much broader concept than these constructs as it involves cognitive and normative influence of institutions as well as affective.

Disciplinary hierarchy. Institutional theory assumes that heterogeneous institutions in a broader society constantly produce diverse and often mutually incompatible institutional logics and arrangements. More importantly, such logics and arrangements are inevitably subject to direct competition with one another, and sometimes some dominate the others, because institutions develop and grow with unequal power and status (Seo & Creed, 2002). Likewise, organizational participants are also in a constant struggle for status, power and dominance by interacting with institutions in a broader society (Benson, 1977; DiMaggio & Powell, 1983). As a result, members of multidisciplinary teams are likely to possess unequal power and status depending on their disciplines as they bring different action logics, legitimacy, and resources from their own discipline

Based on the discussion above, I first define *disciplinary status* as individual perception of relative standing of one's own discipline in the team. Perceived status, as an individual-level construct, is low (high) when an individual believes that his or her own discipline receives low (high) respect and exerts weak (strong) influencing power relative to other disciplines in the team (Thye, 2000). Based on this definition of disciplinary status, *disciplinary hierarchy* is a team-level construct defined as the perceived status difference among different disciplines in a multidisciplinary team. In other words, disciplinary hierarchy is the variation in team members' individual disciplinary status perceptions in the team. In this sense, among five forms of

composition models that Chan (1998) proposed, disciplinary hierarchy is a dispersion model where the “meaning of higher level construct (i.e., disciplinary hierarchy at the team level) is in the dispersion or variance among lower level units (i.e., dispersion among individual perceptions of disciplinary status) (p. 236).” One of the most extreme examples of disciplinary hierarchy may come from multidisciplinary medical teams in health care (Lemieux-Charles & McGuire, 2006). Scholars in medical sociology have long documented that medical professionals have perceptions of status differences across disciplines (Bloom, 1980; Caudill, 1958; Freidson, 2006). In other words, there is the “asymmetrical power (and status) relationship” between those higher up in the medical hierarchy and those lower down” (Lichtenstein, Alexander, McCarthy, & Wells, 2004, p. 324). Lichtenstein et al. (2004) analyzed data from more than 1,000 staffs at 29 neuro-psychiatric hospitals, and found that there indeed existed a hierarchy across disciplines; Among twelve occupations (based on disciplinary categorization), psychiatrists were viewed most privileged, and psychologists, social workers, registered nurses, pharmacists, and occupational therapists followed in this order.

Institutionally endorsed status differences or hierarchy means differentiated influencing power on members of a multidisciplinary team. The influencing power is manifested in how the collective task and its process are defined and understood by the team as a whole and how the resource is allocated for the future (Dougherty, 1992). Therefore, voices and logics of members of a certain discipline can be perceived as more legitimate or having more normative values than those of other members, regardless of their positional power; certain members may enforce their conception of the reality on others by imposing their “dominant logic,” or their conceptualization of the business and resource allocation (Prahalad & Bettis, 1986). In contrary, participants with

low institutional power have no choice but conforming to the conception of dominant participants (Benson, 1977).

Section 3: Voice behavior and Openness to Voice

In my dissertation study, it is proposed that disciplinary embeddedness and hierarchy may influence team member performance in multidisciplinary teams through individual voice behavior and openness to voice. I choose these two mediators for the following reason. A multidisciplinary team requires its members to depend on expertise, skills and knowledge of one another as such resources are localized and distributed across members (Mesmer-Magnus & DeChurch, 2009). Members in such a team should share their own cognitive resources with others and continuously learn from others at the same time in order for themselves as well as the team to perform well. In this regard, openness to voice and voice behavior are both critical in such a team.

Individual voice behavior. Reviewing studies on individual voice behavior, Morrison (2011) provided a definition of voice that integrates its previous conceptualizations -- “discretionary communication of ideas, suggestions, concerns, or opinions about work-related issues with the intent to improve organizational or unit functioning (p. 375).” This definition demonstrates that voice behavior is verbal behavior that expresses one’s thoughts and information, and its intent is constructive. In the sense that voice behavior regards verbal behavior that expresses one’s unique ideas, viewpoints and information to others, it is conceptually similar to information sharing. Information sharing refers to team members’ “conscious and deliberate attempts... to exchange work-related information, keep one another apprised of activities, and inform one another of key developments” (Bunderson & Sutcliffe, 2002, p. 881). As information sharing predicts high quality decision making (Johnson et al., 2006;

Sawyer, Houlette, & Yeagley, 2006; Wittenbaum, Hollingshead, & Botero, 2004), it is certainly one of the predictors that determine performance of multidisciplinary teams (e.g., Bunderson & Sutcliffe, 2002; Srivastava, Bartol, & Locke, 2006). However, I choose voice behavior over information sharing for my dissertation study because the former is more change-oriented than the latter.

Conceptually, the definition of voice behavior emphasizes that voice challenges the status quo (LePine & Van Dyne, 1998), while information sharing is not necessarily change-oriented but more neutral. The reason why the change-oriented feature of voice behavior is more relevant for this study is because this study relies on institutional approach. From the perspective of institutional theory, a multidisciplinary team is a multi-institutional team where incompatible logics and misaligned interests from different disciplines collide with one another. Hence, integrating diverse cognitive resources in such a team by nature involves changing or challenging the taken-for-granted work routines, thinking process, values, world views and even identity that each team member has been taught, trained and institutionally forced to develop (Seo & Creed, 2002). In other words, a multidisciplinary team as a multi-institutional team inherently requires its members to engage in “institutional change” at a lower level. Therefore, change-oriented behavior such as voice behavior may be more relevant for this study. However, admitting the conceptual similarity between voice behavior and information sharing, I consider voice behavior as a specific form of information sharing. Hence, I do not disregard the previous literature on information sharing in developing my model in Chapter 3.

It has been shown that voice behavior is beneficial to teams in many ways. For example, teams of which members actively set forth their unique information and ideas are able to make high quality decisions as they can combine diverse information and viewpoints (Sawyer et al.,

2006). As team members freely exchange their cognitive resources, they can easily learn from each other, find and correct errors, and improve their functioning (De Dreu & West, 2001; Edmondson, 2003; Mesmer-Magnus & DeChurch, 2009; Srivastava et al., 2006). These benefits of voice behavior are especially appreciated in teams where multiple viewpoints from team members should be shared and considered to make collective decisions to function effectively (LePine & Van Dyne, 1998). For example, top management teams of which members have different functional background benefit from actively challenging one another's opinions and points of views in decision making as such debate allows them to consider a wide range of options (Simons et al., 1999). Studies on information sharing in teams also have shown that voice behavior increases quality of decision making and subsequent team performance particularly in teams where each team member has unique specialty rather than in teams where all team members have similar cognitive resources (Mesmer-Magnus & DeChurch, 2009). These theoretical speculation as well as empirical evidence indicates that individual voice behavior is a key contributor to smooth functioning of multidisciplinary teams.

For this practical importance of voice behavior, scholars have put enormous effort on identifying its antecedents (e.g., Detert & Burris, 2007; LePine & Van Dyne, 1998; Morrison, Wheeler-Smith, & Kamdar, 2011; Tangirala & Ramanujam, 2008b; Venkataramani & Tangirala, 2010; Walumbwa & Schaubroeck, 2009). At the same time, they have also tried to answer the question why individuals choose *not* to voice even when they possess potentially useful ideas and information and have intent to benefit their work units and organizations (e.g., Bowen & Blackmon, 2003; Milliken, Morrison, & Hewlin, 2003; Morrison & Milliken, 2000; Tangirala & Ramanujam, 2008a). Morrison (2011) extensively reviewed this scholastic endeavor and concluded that voice behavior is mostly an outcome of deliberate decision making process that

involves two key factors. One is *perceived efficacy* of voice, which refers to the degree to which an individual perceives that her voice behavior will produce desired outcomes (Bandura, 1977). This is based on Vroom's (1964) expectancy theory that people put effort in certain behavior when they believe that doing so will be effective. For example, a scientist who spotted a mechanical error in a research project would not make voice eagerly unless she has a strong belief that her voice will be heard and the error will be corrected effectively. The other factor is *perceived safety* of voice, or "the risks or potential negative outcomes associated with speaking up (Morrison, 2011, p. 382)." Voice is risky in the sense that it challenges the status quo and expresses opinions and beliefs that are different from others. Therefore, by speaking up, an individual may take disadvantages especially in interpersonal relationships with her supervisor and peers (LePine & Van Dyne, 2001; Milliken et al., 2003; Walumbwa & Schaubroeck, 2009). Therefore, individuals tend to engage in voice behavior more when they believe more strongly that speaking up brings no harm. For example, employees speak up when they personally trust their supervisors (Premaux & Bedeian, 2003), have low likelihood of punishment thanks to their high status (Fuller et al., 2006), and feel that their peers will appreciate rather than punish their behavior (Morrison et al., 2011).

Openness to voice. Even if a team member expresses one's opinions and shares her ideas and information, it would be useless if other members do not pay attention to or listen to them. In other words, a new piece of information should be "digested" by team members in order to affect team cognition and subsequent team performance (Argote, Gruenfeld, & Naquin, 2001; Hinsz, Tindale, & Vollrath, 1997). Although such process of voice recipients has not been highlighted very much in the voice literature, similar constructs have been investigated in other areas including decision making and information sharing. These studies were commonly interested in

the degree to which an individual or a group accepts and utilizes a new idea, suggestion or information from others (Argote & Kane, 2003; Choi & Levine, 2004; De Dreu & West, 2001; Gruenfeld, Martorana, & Fan, 2000) rather than resists (Fernandez & Rodrik, 1991; Janis, 1972; Samuelson & Zeckhauser, 1988) or feels offended and irritated (Hornsey et al., 2007). Based upon these, I define *openness to voice* as the extent to which an individual pays enough attention to and evaluate fairly new information, opinions, suggestions and ideas from others.

Undoubtedly, openness to voice helps team functioning because it enables to consider a wide range of options from various perspectives in decision making (Dahlin et al., 2005; Homan et al., 2007), to detect errors and malfunctioning (De Dreu, 2007; De Dreu & West, 2001; Schippers, Den Hartog, Koopman, & Wienk, 2003) and to be innovative (De Dreu, 2002). Hence, many scholars have devoted to identify what makes an individual or a group to be more open to new suggestions and knowledge from others. Such antecedents include: interpersonal relationship between the message sender (i.e., the person who makes voice) and the receiver (i.e., the others) (Menon & Blount, 2003; Menon & Pfeffer, 2003; Menon, Thompson, & Choi, 2006), group norms and values (Homan et al., 2007; Postmes, Spears, & Cihangir, 2001), and individual dispositions (Doherty, 1998; Levin, Huneke, & Jasper, 2000).

Openness to voice is an important process for institutional change from the viewpoint of institutional approach as well. According to Seo and Creed (2002), social actors who are continuously exposed to multiple institutions and experience misalignment, incompatibility and inefficiency due to contradictions among them, eventually become open to other institutions and gradually reshape their consciousness (Benson, 1977; Clemens & Cook, 1999; Oliver, 1992). It is because, in such a situation, social actors come to reconsider formally taken-for-granted logic, rules and norms of their old institution and seek for alternatives in order to reduce inefficiency

and ineffectiveness (Roberts & Greenwood, 1997). Openness to voice defined in micro OB literature can be viewed as a type of this “reflective shift” of institutional approach (Seo & Creed, 2002).

Section 3: Team Leaders as Institutional Entrepreneurs

From the viewpoint of institutional approach, multidisciplinary teams are a place where different institutional logics and norms collide and conflict (Hargrave & Van de Ven, 2006). Individuals who are deeply embedded in their own institutions cannot resolve such “institutional contradictions” for themselves (Seo & Creed, 2002). Therefore, institutional theorists emphasize the role of a leader who creates new institutional arrangements that resolve such contradictions, or an “institutional entrepreneur” (DiMaggio, 1988; Fligstein, 1997). Fligstein (1997, 2001) suggested that some individuals are better than others in inducing cooperation among others to create new institutional arrangements or have higher level of *social skill*. Fligstein (1997) defined social skill as “the ability to motive cooperation in other actors by providing those actors with common meanings and identities in which actions can be undertaken and justified (p. 398).”

In his conceptualization of social skill, Fligstein (1997; 2001) stressed two responsibilities of institutional entrepreneurs. One is that they should have broader worldviews that determine which behavior is considered legitimate and which outcome is considered most valuable. The other is that they should create a collective identity of a new organizational field (i.e., multidisciplinary teams in the context of this study) (Ansell, 1997). To accomplish these responsibilities, institutional entrepreneurs should understand unique interests and preferences of various groups (i.e., institutions) that exist in the field and be aware of what action will make sense to all of them (Fligstein, 1997). In addition, it is important for institutional entrepreneurs to remain (or at least look) neutral and without self-interest (Fligstein, 1997; 2001). Fligstein’s

(1997; 2001) conceptualization of skilled institutional entrepreneurs provides me an insight of two leader attributes that might alleviate the negative effects of disciplinary embeddedness and hierarchy: disciplinary background breadth and transformational leadership.

Disciplinary background breadth. *Disciplinary background breadth* refers to the degree to which an individual has had work experiences in diverse disciplinary domains (Bunderson, 2003a; Walsh, 1988). Although scarce, there have been a small number of studies that dealt with background breadth of leaders. Such studies were interested in how background breadth, mostly obtained through job rotation (Burke & Steensma, 1998; Campion, Cheraskin, & Stevens, 1994), shapes cognitive characteristics of managers and their subsequent performance (Beyer et al., 1997; Dearborn & Simon, 1958; Walsh, 1988). A common conclusion of those studies is that leaders who have experiences in various disciplinary or functional areas perform better as they are better able to process diverse information, knowledge and perspectives (Campion et al., 1994; Norburn, 1989; Raskas & Brick, 1992). Bunderson (2003b) explained that;

A breadth of functional experience provides an understanding of different functions and how they relate, enabling a team member to help resolve uncertainties associated with cross-functional coordination and integration. And experience in those functions that relate to strategically critical aspects of the team's task environment ensures that a team member understands and can help resolve the most pressing uncertainties faced by the team (p. 459).

Transformational leadership. A *transformational leader* is a leader who “broadens and elevates the interests of their employees, generates awareness and acceptance of the purposes and mission of the group, and stirs their employees to look beyond their own self-interest for the good of the group” (Bass, 1990: 21). Transformational leadership consists of the following four dimensions (Bass, 1990; Bass & Avolio, 1993): First is *charisma* (or idealized influence). A leader is charismatic when she provides a vivid vision and a sense of mission, and sets high

standards and establishes challenging goals. This is a source of respect and trust from followers. Second is *inspirational motivation*; Transformational leaders use symbols to motivate and emotionally appeal to followers that common goals are important and desirable. The third factor is *intellectual stimulation*; Transformational leaders promote critical thinking and encourage novel ideas. Followers are welcome to question current beliefs and expectations of their own as well as those of leaders and organizations. The final factor of transformational leadership is *individualized consideration*. Transformational leaders concern the development of their followers, treat followers differently and also equitably, and provide personal attention, coaching and advice to each follower (Rafferty & Griffin, 2004).

Numerous studies have shown that transformational leadership produces various positive outcomes. Three meta-analysis studies have shown that transformational leadership has a significant influence on subordinates' in-role as well as extra-role performance (Fuller, Patterson, Hester, & Donna, 1996; Judge & Piccolo, 2004; Lowe, Kroeck, & Sivasubramaniam, 1996). Transformational leaders influence subordinates so effectively because they build trust and value congruence with subordinates (Colbert, Kristof-Brown, Bradley, & Barrick, 2008; Jung & Avolio, 2000), facilitates efficacy beliefs of subordinates and cohesion among them (Bass, Avolio, Jung, & Berson, 2003; Kark, Shamir, & Chen, 2003) and make subordinates feel motivated and committed to accomplish the goal (Piccolo & Colquitt, 2006). Subordinates of transformational leaders also tend to feel satisfied with the job and the leader and committed to the organization as well (Bono & Judge, 2003).

Section 4: Team Commitment

Team commitment is the extent to which an individual identifies and feels involved with a particular team (Bishop & Scott, 2000; Bishop, Scott, & Burroughs, 2000). An individual who is

highly committed to the team strongly “believes in and accepts its goals and values, willing to make considerable effort on behalf of the team, and strongly desire to maintain team membership (Bishop & Scott, 2000, p. 439).” I include team commitment in my research model as a potential moderator guided by institutional theory. As discussed earlier, multidisciplinary teams are a place where incompatible norms, logics, identities and viewpoints from different disciplines co-exist, which eventually leads social actors to feel the necessity of institutional change (Seo & Creed, 2002). Studies on institutional change have suggested that such change occur more easily when social actors feel committed to the cause of the change or the new institution (Johnson, Smith, & Codling, 2000; King & Pearce, 2010, for a review). It is because feelings of such commitment let actors less resistant or more vulnerable to new logics and viewpoints (Cialdini & Goldstein, 2004). This indicates that commitment to the team (i.e., the new institution or the cause of the change) may play an important role in the micro-level institutional change that members of multidisciplinary teams experience.

A number of studies have found that, when an individual feels committed to a social group such as a team and an organization, she tends to engage in various behaviors that are considered desirable for the group. Two meta-analyses from Riketta and Van Dick (2005) and Mathieu and Zajac (1990) concluded that more committed individuals in general accomplish their tasks better, engage in more extra-role behavior, and demonstrate less withdrawal behavior including turn-over.

Chapter 3: Theory and Hypotheses

In Chapter 3, I propose a research model on the effects of disciplinary embeddedness and hierarchy on team member performance in multidisciplinary teams. As illustrated in Figure 1, Hypothesis 1 and 2 include the direct and indirect individual-level effects of disciplinary embeddedness on team member performance via openness to voice, respectively. Hypothesis 3 and 4 regard the direct and indirect cross-level effects of disciplinary hierarchy on team member performance via voice behavior, respectively. From Hypothesis 5 through 9, it is hypothesized that transformational leadership (Hypothesis 5 and 6) and leader disciplinary background breadth (Hypothesis 7) at the team level and team commitment (Hypothesis 8 and 9) at the individual level moderate the effects of disciplinary embeddedness and hierarchy. Below, I justify each of the relationships proposed.

Insert Figure 1 about here

Section 1: The Negative Effects of Disciplinary Embeddedness

In my dissertation study, disciplinary embeddedness is proposed to have negative influence on openness to voice for three reasons. First, individuals who are cognitively embedded in their discipline more strongly than others are likely to experience more difficulties in understanding ideas and opinions suggested by other team members with different disciplinary backgrounds. By definition, institutionally embedded individuals are professionals who have built up their knowledge systems strictly based on cognitive schemas and technical language of their discipline. Therefore, when suggestions are made by professionals from other disciplines, it is likely that they are unable to “translate” what others mean because ideas and information from different disciplines are typically described using different technical terms, logics, scientific

approaches and models. When this occurs, individuals who are highly embedded in one's discipline may resolve the situation by simply rejecting the new ideas because, otherwise, it may cost too much effort on their end (Barber, 1961; Kuhn, 1962).

Second, individuals affectively embedded in their discipline more strongly may feel more resistant to accept what others suggest because they are likely to categorize people from other disciplines as "outsiders." Studies on social identity theory have shown that people highly identified with their in-group are inclined to be more exclusive in defining the in-group, and segregate others more strongly into an out-group (Castano, Yzerbyt, Bourguignon, & Seron, 2002; Pickett & Brewer, 2005). Once this happens, it is likely that embedded individuals reject ideas and information suggested by others. According to Menon and her colleagues (Menon & Blount, 2003; Menon & Pfeffer, 2003; Menon et al., 2006), people tend to evaluate messages negatively when they come from out-group members particularly who compete with their in-group. Once the voicer is categorized as an out-group member, the message is likely to be viewed negatively because, in a multidisciplinary team as a multi-institutional team, members from different disciplines compete with one another, as discussed earlier (Thornton, 2002).

Third, individuals normatively embedded in their discipline more strongly than others may feel more resistant to accept what others suggest because they are sensitive to how others in their discipline would react. Institutionally embedded individuals are strongly influenced by social norms that provide legitimacy on particular work procedures and processes. They are likely to refuse to accept new ideas containing procedures and processes that are not permitted in their own discipline because, otherwise, they may lose social support from others in their own discipline and thus rewarding relationship with them (Cialdini & Goldstein, 2004). With these

reasons combined, I predict that an individual with stronger disciplinary embeddedness may exhibit a higher level of openness to voice.

Hypothesis 1: Disciplinary embeddedness is negatively related to openness to voice.

I propose that the effect of individual disciplinary embeddedness on openness to voice may be also mediated to individual team member performance. In a multidisciplinary team where expertise, skills and knowledge that are required to complete tasks are distributed across members, it is critical for a team member to work closely with other members to get necessary cognitive resources. Therefore, members of such a team have to listen to what others suggest and learn actively from them. A team member who is close-minded to ideas and suggestions that are different from one's own is less likely to utilize various viewpoints and information shared by others through constructive debates with them (Kearney, Gebert, & Voelpel, 2009; Mitchell, Nicholas, & Boyle, 2009) and adapt their work processes accordingly (Griffin, Neal, & Parker, 2007). Therefore, such an individual is likely to perform poorer than others by failing to maximize the benefit of his diverse work environment (Homan et al., 2008). Therefore, I expect that the negative effect of embeddedness on openness to voice consequently results in poor performance.

Hypothesis 2: Openness to voice mediates the relationship between disciplinary embeddedness and team member performance.

Section 2: The Negative Effects of Disciplinary Hierarchy

I suggest that disciplinary hierarchy at the team level would have a negative cross-level effect on individual voice behavior for the following reasons. High disciplinary hierarchy indicates that one or a few disciplines monopolize influencing power in the team. From the viewpoint of institutional theory, this means that logics and arrangements of a high status

discipline(s) are strongly taken-for-granted, or perceived legitimate (Prahalad & Bettis, 1986). Perception of legitimacy indicates that a group of social actors have a “shared” assumption or belief that “the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995, p. 574).” One can perceive a certain pattern of behavior legitimate even though it deviates from her own individual values “because the deviation draws no public disapproval (p. 574).” Once logics and arrangements of a high status discipline(s) obtain legitimacy in a multidisciplinary team, communicating messages that challenge the status quo of the discipline(s) is subject to decrease, regardless of disciplinary status of each team member. For those from a high status discipline(s), it is unnecessary to make changes because established logics, norms and performance criteria in the team correspond to their own that they are familiar with and take for granted. As they are less likely to be dissatisfied with the current work procedures and approaches to problems in the team, they are expected not to express change-oriented messages to the team (Rusbult, Farrell, Rogers, & Mainous III, 1988; Withey & Cooper, 1989).

I expect that voice behavior of team members from a low status discipline(s) may also decrease in teams with strong disciplinary hierarchy, but for different reasons. Unlike those from a high status discipline(s), members from a low are likely to feel unfamiliar with and dissatisfied with the current work procedures and norms of the team because they are dominated by the logics and arrangements of the high status discipline(s). However, they are expected to suppress change-oriented messages and conform to the current arrangements in teams with strong hierarchy (Hewlin, 2003), because they are aware that the status quo of the team represents what the team as a whole accepts and agrees to be legitimate, or what is socially approved (Suchman, 1995). In such a situation, they are prone to have a low expectancy belief for voice behavior. In

other words, they probably expect that their voice behavior will not make any differences but be easily rejected or ignored by others (Balkwell, 1991; Littlepage, Schmidt, Whisler, & Frost, 1995; Venkataramani & Tangirala, 2010). In addition, in a stronger hierarchy, low status team members may have even a lower safety perception for voice behavior. Individuals with low status are likely to be punished or disadvantaged for their challenging behavior by individuals with high status (Edmondson, 1999; Nembhard & Edmondson, 2006; Sell, Lovaglia, Mannix, Samuelson, & Wilson, 2004; Thye, 2000; Walumbwa & Schaubroeck, 2009). This tendency may increase as hierarchy gets stronger because stronger hierarchy means that high status members have even more power and resources.

These reasons combined suggest that team members on a team with stronger disciplinary hierarchy may tend to engage less in voice behavior regardless of her disciplinary status (Bunderson, 2003b; Morrison et al., 2011). On the other hand, in a team with weak disciplinary hierarchy, it is anticipated that team members actively exchange challenging messages because there is no established patterns of behavior that are collectively approved and accepted. Rather, as disciplines seek hegemony of the team in such a situation, team members are to actively vocalize their dissatisfactions, concerns and new suggestions (Lau & Murnighan, 1998). Therefore, disciplinary hierarchy is predicted to have a negative cross-level effect on individual voice behavior.

Hypothesis 3: Disciplinary hierarchy is negatively related to team members' voice behavior.

I also suggest that disciplinary hierarchy may indirectly lower team member performance through voice behavior. As discussed earlier, tasks in a multidisciplinary team are by nature highly interdependent as required cognitive resources are localized. In such a work environment,

team members should actively exchange their unique resources with one another and even challenge and debate with others on team discussion on collective tasks (Lovelace et al., 2001). Therefore, not making one's voice enough is likely to be considered that the team member is not making enough contribution to the team (Van Dyne & LePine, 1998). In this regard, an individual who does not share his unique ideas and knowledge with others due to high disciplinary hierarchy on her team is likely to be rated a poor contributor to the team. Hence, the negative cross-level effect of disciplinary hierarchy on individual voice behavior is expected to be mediated to team member performance.

Hypothesis 4: Individual voice mediates the negative relationship between disciplinary hierarchy and team member performance.

Section 3: The Moderating Effects of Team Leadership

Transformational leadership. I propose that transformational leadership may reduce the negative relationship between disciplinary embeddedness and openness to voice for the following two reasons. First, transformational leadership fosters collective identity from followers through charisma and inspirational motivation (Conger, Kanungo, & Menon, 2000; House, Shamir, Chemers, & Ayman, 1993; Kark et al., 2003; Shamir, House, & Arthur, 1993; Walumbwa, Avolio, & Zhu, 2008). This is because transformational leaders keep tying individual to the collective and emphasizing the moral importance of achieving the collective goals and missions using symbolic and inspiring messages (Hogg, 2001; Shamir et al., 1993). Once this happens, personal identity with one's discipline may get weak, because it is not easy for multiple identities to be activated at the same time due to the limited attention capacity of individuals (Brewer & Gardner, 1996; Lord, Brown, & Freiberg, 1999). Therefore, team members who used to be highly embedded in their discipline may feel less resistant to accept

ideas, suggestions and information from others from different disciplines (Kearney & Gebert, 2009). If collective identification with the team as a result of transformational leadership gets strong enough, team members who are from other disciplines and used to be categorized as an out-group member, may become “recategorized” as an in-group member (Ashforth & Mael, 1989). This can ease reluctance of accepting new ideas and suggestions from them.

Second, transformational leaders are likely to make team members more committed and open to changes at workplace (Herold, Fedor, Caldwell, & Liu, 2008; Oreg & Berson, 2011). It is because transformational leaders communicate the importance and the value of change more effectively with followers, provide a vivid and optimistic blueprint for change, and empower and stimulate followers in the process (Herold et al., 2008). In this way, transformational leaders may be able to influence followers’ mind to accept new ideas and suggestions from others rather than sticking to old ones. In this regard, I expect that;

Hypothesis 5: Transformational leadership moderates the relationship between disciplinary embeddedness and openness to voice such that the negative relationship is weaker when transformational leadership is higher.

In addition, I expect that transformational leadership may moderate the negative relationship between disciplinary hierarchy and voice behavior as well. Earlier, I suggested that disciplinary hierarchy may decrease voice behavior because it provides strong “taken-for-grantedness” for existing logics and arrangements of a high status discipline(s) that dominate team functioning, and makes low status members feel even more vulnerable and impotent in challenging the status quo. Transformational leadership is likely to mitigate all these tendencies. Through intellectual stimulation and individualized consideration, transformational leaders encourage followers to be change-oriented and challenging rather than content with and

compliant to the status quo (Bass & Riggio, 2006). Therefore, transformational leaders are likely able to provoke team members to think from a different perspective and express new ideas freely. Transformational leadership may particularly ease the difficulties of voice behavior for low status members as they give an impression that team members' voice would be welcome and appreciated rather than punished (Detert & Burris, 2007). Also, equal treatment of transformational leader across team members would lead members to believe that their suggestions will be objectively valued (Pillai, Schriesheim, & Williams, 1999). In other words, transformational leadership might prevent expectancy belief for voice behavior from decreasing due to disciplinary hierarchy. Taken together, this discussion implies that when there is disciplinary hierarchy in a multidisciplinary team, transformational leadership may function like a buffer that offsets its negative effects.

Hypothesis 6: Transformational leadership moderates the relationship between disciplinary hierarchy and individual voice behavior such that the negative relationship is weaker when transformational leadership is higher.

Leader disciplinary background breadth. I posit that leaders with high background breadth are likely to mitigate the negative effects of disciplinary hierarchy on individual voice behavior for the following three reasons. First, leader's background breadth may enable the leader to foster new agreements and agenda and develop new goals that make sense to a majority of team members in spite of the presence of disciplinary hierarchy. Campion et al. (1994) found that managers who have a broad spectrum of functional experiences tended to develop understandings of a broad picture of business operations of their organizations and relationships among different functions. Studies on managers' functional experience and selective perception also suggest that managers who have worked in various functional areas may consider a wider

range of information at work (Beyer et al., 1997; Dearborn & Simon, 1958). In this regard, leaders who have high level of disciplinary background breadth may be able to create new collective agenda or goals for the team that the majority of team members can understand and agree with. This may bring two outcomes. First, it may reduce the taken-for-grantedness of existing logics and arrangements of a high status discipline(s) that dominate the team and encourage both high and low status team members to take different perspectives. In addition, even if there is strong disciplinary hierarchy in the team, team members may feel more committed to newly suggested collective goals of the team and thus make voice more eagerly.

Second, leader's background breadth may increase expectancy belief for voice of team members. A professional in a multidisciplinary team would expect that his or her suggestions are more likely to be understood and accepted by a leader when the leader has experience in his or her field. A leader who has no experience in her discipline may not be able to fully understand her new ideas or suggestions and therefore disregard the suggestions. Beyer et al.'s (1997) finding that managers with a narrow range of background failed to pay attention to diverse information backs up this expectation. Although Bunderson and Sutcliffe (2002) did not deal with a leader-related phenomenon, their team-level study is consistent with this reasoning as well. In a study of multidisciplinary teams, they found that team members are more likely to share unique information when they work with team members who have a broad range of background rather than narrow. The authors explained that this is at least partly due to their heightened expectancy belief about voice behavior. Likewise, I expect that a leader, who is a generalist, rather than a specialist, would recover the expectancy belief that has been lowered due to high disciplinary hierarchy.

Finally, a leader with broad disciplinary background may increase safety perception of team members as well. Since such a leader “seems neutral” and well representing a multidisciplinary team rather than affiliated to a particular discipline, team members may believe that their change-oriented suggestions are considered in a fair and objective manner (Brewer, 1979; Cronshaw & Lord, 1987; Lord, Foti, & De Vader, 1984; Ullrich, Christ, & van Dick, 2009; van Dijke & De Cremer, 2008). Therefore, team members who have a leader with high background breadth might believe that they will not get any disadvantage by speaking up. Taken together, this line of reasoning suggests that leader’s high level of disciplinary background breadth might attenuate the negative relationship between disciplinary hierarchy and individual voice behavior positive because it cancels out the negative effect of hierarchy.

Hypothesis 7: Disciplinary background breadth of team leaders moderates the relationship between disciplinary hierarchy and voice behavior such that the negative relationship is weaker when breadth is higher.

Section 4: The Moderating Effects of Team Commitment

In my dissertation study, it is proposed that team commitment may mitigate the negative effect of disciplinary embeddedness on openness to voice. Commitment to social foci such as a team is one of “energizing forces for motivated behavior” (Meyer, Becker, & Vandenberghe, 2004). For example, an individual committed to a team tends to engage in motivated behavior that is desirable for the team such as in-role and extra-role behavior and less motivated in engaging in undesirable behavior such as turn-over (Becker & Kernan, 2003; Vandenberghe, Bentein, & Stinglhamber, 2004). For an individual embedded in her discipline, keeping an attitude open to ideas and suggestions from other disciplines is not easy, as proposed earlier. However, it is expected that it can

be overcome if she is highly committed to the team. It is because committed individuals who are identified with the goals, values and missions of the team are motivated to make more effort for the team (Meyer et al., 2004). Hence, they are likely more willing to accept new suggestions and ideas from other disciplines and make changes based on them (Herold et al., 2008; Iverson, 1996; Madsen et al., 2005; Van der Vegt & Bunderson, 2005). Therefore, I suggest that individuals highly committed to the team are likely to be open-minded to change-oriented messages even if they are embedded in their discipline.

Hypothesis 8: Team commitment moderates the relationship between disciplinary embeddedness and openness to voice such that the negative relationship is weaker when team commitment is higher.

In the similar vein, I expect that team commitment may weaken the negative effect of disciplinary hierarchy on voice behavior as well. As committed individuals identify themselves with the team, internalize the goals and the values of the team, and make effort to get rewarded by the team (O'Reilly & Chatman, 1986), they are typically more devoted in improving team functioning (Mael & Ashforth, 1992). Therefore, they are more concerned about the potential adverse effect that they may cause to the team by holding back critical ideas and information (Tangirala & Ramanujam, 2008a) and tend to speak up more (Morrison et al., 2011). In this regard, I expect that team members more committed to the team than others are likely to make voice even if they are in a team with strong disciplinary hierarchy.

Hypothesis 9: Team commitment moderates the relationship between disciplinary hierarchy and voice behavior such that the negative relationship is weaker when team commitment is higher.

Chapter 4: Research Methodology

Sample and Data Collection Procedure

A large-scale national research institute of science and technology located in Seoul, the capital city of South Korea, participated in this study. First, I conducted preliminary interviews with 6 researchers from different research divisions of the institute who had experience of working in a multidisciplinary research team. Then, I administered surveys to one out of six research divisions of the institute. The division consisted of regular employees such as research scientists and technicians, and temporary employees such as visiting researchers, fellows and student researchers. This division was selected since it was the division where multidisciplinary research projects were most frequently conducted.

The research division had an informal organizational structure of research teams where a senior regular researcher played a role of a team leader of several other regular and temporary researchers. However, the research team was a kind of an open-system. Although members of a research team primarily worked as a team for research projects, researchers there often formed a temporary research group with researchers from other teams for a certain project. In other words, researchers sometimes worked across the boundary of their research team depending on research projects. Therefore, questionnaires were carefully designed so that respondents were clearly aware of which research team on which research project they were asked about in the survey.

Paper-and-pencil questionnaires were distributed to 221 research team members and 35 leaders, 256 researchers in total. They were asked to return a complete survey in a sealed envelope enclosed with the survey. 161 team members and 31 leaders completed the questionnaires, which makes the response rate 75% (192 out of 256). Among them, data from 23 team members and 5 leaders were removed because their responses had missing data points, or

less than two of their team members participated the survey. This left 138 team members and 23 leaders from 23 research teams in the final data set for hypothesis testing. 66% of the respondents were male, and all of them were Korean. The average age of the participants was 29.7 years (SD: 5.5), and 67% of them had a master's or doctoral degree in various areas of science and technology.

Measures

Since the first language in South Korea is not English but Korean, all the measures were carefully translated into Korean. In order to prevent the common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), the predictors (i.e., disciplinary embeddedness and status, and team commitment) were self-reported, while the predicted (i.e., voice behavior, openness to voice and team member performance) were peer-rated at the individual level. Team leaders completed questionnaires which included most of the items from the team member survey but the leadership items. At the team (leader) level, disciplinary hierarchy was aggregated from the disciplinary status measure assessed at the individual-level. Among the two leader-related moderators, transformational leadership was rated by team members and aggregated to the leader level. Disciplinary background breadth was calculated using the disciplinary background information reported in the team leader survey. All the measures that are subjectively rated by the participants were a 5-point Likert type scale (1 = "strongly disagree," 5 = "strongly agree"). A complete list of the survey items is provided in Appendix.

Disciplinary embeddedness. I assessed disciplinary embeddedness based on participants' self-report on their perceptions, attitudes and behavior. Previously, disciplinary embeddedness was defined as the extent to which an individual is cognitively, affectively and normatively influenced by his or her disciplinary background. These three components (i.e., cognitive,

affective and normative) were measured in separate scales. Cognitive embeddedness represents the extent to which an individual is accustomed to and habitually uses the schemes, “languages,” thought processes and world views that are generated in his or her discipline. To capture it, a new five-item scale was developed for this study. Sample items include; “I am familiar with technical terms and idioms that are used only in my discipline,” “I have been rigorously educated and trained to use specific thought processes that are encouraged in my discipline,” and “It is sometimes difficult to think outside of the way of thinking of my discipline.”

Affective embeddedness was operationalized as disciplinary identification, or “involvement based on a desire for affiliation (O'Reilly & Chatman, 1986)” with one’s discipline. Specifically, I modified and used organizational identification scale from O’Reilly and Chatman’s (1986) study. Among the three items of the original scale, I excluded one item that cannot be modified to discipline-related wording. The final two items include; “I am proud to tell others that I am a part of this discipline” and “I feel a sense of ‘ownership’ for this discipline rather than being just a member.” Normative embeddedness was operationalized as the degree to which an individual is subject and committed to disciplinary norms, standards, rules and expectations. It was measured using a three-item scale which is a shortened and modified version of individual susceptibility to normative influence scale from Bearden, Netemeyer and Teel (1989). Examples of the items include; “I rarely engage in behavior that professionals in my discipline would not approve of,” and “It is important that other professionals in my discipline acknowledge the procedures and methods that I use in my job.”

As disciplinary embeddedness is a new construct, I conducted a series of confirmatory factor analysis (CFA) to confirm its dimensionality. Specifically, I generated three models and compare their fit indices. The first model was a one factor model in which all ten items were

loaded on one latent variable. Second was a three factor model in which items were loaded on three corresponding dimensions (i.e., cognitive, affective and normative). The final model was a second-order model. This model had three dimensions just like in the three factor model, but those dimensions were loaded on a second-order latent variable (i.e., overall embeddedness) unlike in the previous model. The fit indices from the one factor model indicated relatively a poor fit (χ^2 [35] =132.93, CFI = .69, SRMR = .09, RMSEA = .12). The three factor model and the second-order model produced the same fit indices, which indicated a better fit than the one factor model (χ^2 [32] =48.38, CFI = .95, SRMR = .05, RMSEA = .05). However, all the second-order factor loadings from the second-order model were positive as expected and statistically significant (.39 for the cognitive dimension, .31 for the affective dimension, and .41 for the normative dimension). This statistically supports my theoretical assumption that disciplinary embeddedness is a single construct consisting of three dimensions. Therefore, disciplinary embeddedness was computed by averaging individual scores on these three components (i.e., cognitive, affective and normative components). The reliability coefficient (Cronbach's α) for the scale was sufficiently high (.72).

Then, to ensure validity of the construct, I checked convergent, discriminant and criterion-related validity of disciplinary embeddedness (Hinkin, 1998), First, convergent validity “is achieved when the correlations between measures of similar constructs using different methods (p. 116).” To test it, I used two objective proxies of the construct. One was the level of educational background; a person has higher educational background if she has a doctoral degree in her discipline than a master's or a bachelor's, for example. The other was the average number of academic conferences and workshops held in one's discipline that an individual attends in a year. The underlying assumption of these proxies is that the amount of time spent in a discipline

and the level of interactions with members of the discipline may represent the degree of disciplinary influence (i.e., institutional influence) and/or individual attachment to the discipline (DiMaggio & Powell, 1983). The correlation coefficients of disciplinary embeddedness and these two proxies were both .22 ($p < .05$), which indicates that my measure of disciplinary embeddedness has sufficiently high correlations with other types of measures of the same construct. Hence, convergent validity was achieved.

Second, discriminant validity is achieved when the focal construct is not correlated with conceptually dissimilar constructs (Hinkin, 1998). As disciplinary embeddedness is an expanded concept that combines pre-existing constructs (i.e., the three components), rather than a brand-new concept that should be conceptually differentiated from others, I did not test discriminant validity very rigorously. However, I did check if it is empirically distinguished from the disciplinary status measure that I will describe below by conducting a series of CFAs. Specifically, I compared a two-factor measurement model assuming that disciplinary embeddedness and status are distinct with a more constrained alternative model, which set the correlation between the two measures to be 1.00. The fit indices from the two-factor model showed that the model fits very well the data ($\chi^2 [61] = 88.7$, CFI = .95, RMSEA = .05). The alternative model assuming that disciplinary embeddedness and status coincide generated poorer fit indices ($\chi^2 [62] = 127.0$, CFI = .88, RMSEA = .08)¹. The Chi-square difference test indicates that the former model is significantly better than the latter ($\Delta\chi^2 [1] = 38.3$, $p < .05$). Therefore, the disciplinary embeddedness measure was shown to be distinct from the disciplinary status measure.

¹ SRMRs were not generated for these analyses due to missing data.

Finally, criterion-related validity is achieved when a theoretically assumed nomological relationship between the focal construct and a criterion variable is found to be empirically significant. This was automatically checked in testing the main effects of disciplinary embeddedness on openness to voice and team member performance. As described later in Chapter 4, the relationships between them were all significant and in expected directions. Therefore, criterion-related validity was also attained.

Disciplinary hierarchy. In order to assess disciplinary hierarchy, which is a team-level construct, I first measured disciplinary status at the individual level. From the viewpoint of institutional theory, the relative status of an institution (i.e., discipline) is reflected in the degree to which social actors consider its logic more important and legitimate than others' when there are mutually exclusive logics from different institutions competing with one another (Prahalad & Bettis, 1986). To capture this, I asked participants to answer the following three questions developed for this study; "In my team, the viewpoints and logic of my discipline are chosen when disciplines have different logics, viewpoints, and problem-solutions," "It is considered more persuasive when explained with the viewpoints and logics of my discipline when disciplines have different logics, viewpoints, and problem-solutions," and "My discipline is perceived most powerful and privileged among others in my team." The result of principal component analysis indicated that a single factor was extracted from the three items (eigenvalue = 2.19), and all three items had quite high factor loadings on it (.89, .85 and .81, respectively). The reliability coefficient for the scale was also high (.82). Thus, I calculated the individual score for disciplinary status by averaging individual ratings of the three items.

In order to check its convergent validity, I included another type of disciplinary status measure, which is more indirect than the original scale. Participants were asked to list all the

disciplines that existed on their team including their own, and then to rate each of them on the relative status compared to their own. More specifically, the instruction was (Levin, 2004); “There are many people who believe that different disciplines enjoy different amounts of social status in this society. You may not believe this for yourself, but if you had to rate the social status of each of the disciplines that your team members have, including your own, as most people see them, how would you do so?” Then I calculated the status score of each discipline by averaging the ratings of *all* participants throughout the research division, who reported on the status of the corresponding discipline. The average inter-rater agreement (i.e., r_{wg} , James, Demaree, & Wolf, 1984) was .65, which indicates fairly high agreement across participants. The inter-rater reliabilities were .07 (ICC(1), $F = 2.96$, $p < .05$) and .66 (ICC(2), Bliese, 2000), which was sufficiently high as well. This indicates that researchers at the division had a *shared* perception of the relative status of each discipline in general. In other words, perception of disciplinary status was not a within-team phenomenon; rather, individuals throughout the organization had an implicit agreement on the presence of disciplinary status and the level of status of each discipline. This provides an additional ground to adopt institutional theory that assumes institutional hierarchy at a high level (i.e., organization or larger society) in explaining the phenomena of interest. Finally, I checked the correlation between the original disciplinary status score and the status score from the second indirect approach, which was positive and significant ($r = .19$, $p < .05$). Hence, the original measure of disciplinary status achieved convergent validity (Hinkin, 1998).

Now I calculated disciplinary hierarchy score following Harrison and Klein (2007)’s recommendation for a type of diversity called disparity. *Disparity* concerns “composition of (vertical) differences in proportion of socially valued assets or resources held among unit

members (p. 1203)” such as status and power. Specifically, I computed the coefficient of variation of each team’s disparity on status (S), which is calculated as below (n = team size);

$$\frac{\sqrt{\frac{\sum(S_i - S_{\text{mean}})^2}{n}}}{S_{\text{mean}}}$$

I used the coefficient of variation to calculate disciplinary hierarchy in order to capture “both the distances between team members and the dominance of (concentration of the status in) those who have higher (p. 1212)” level of status. Hence, when a small number of team members enjoy a high level of status, disciplinary hierarchy is greater than when a large number of those do so. In this formula, the standard deviation of disciplinary status is divided by its mean. This is to reflect that status differentiation is less important in teams where disciplinary status generally higher among team members. Computed this way, disciplinary hierarchy is lowest when all team members have the exactly same level of disciplinary status, and highest when $n - 1$ team members score 1 and one member scores 5 on the 5-point scale of disciplinary status (Harrison & Klein, 2007).

Moderators. Following Bunderson (2003b) and Bunderson and Sutcliffe (2002), the following equation was used to calculate individual score of *disciplinary background breadth* of team leaders.

$$1 - \sum_{j=1}^k p_{ij}^2,$$

where p_{ij} equals the percentage of team leader i ’s total years of experience spent in the j th disciplinary area of the k disciplinary areas examined. This is an adaptation of Blau’s (1977) heterogeneity index (Bunderson, 2003b), which indicates the level of qualitative distinctions on one’s disciplinary background (Harrison & Klein, 2007). In other words, this demonstrates the extent to which past research-related experience of a leader spreads “across qualitatively

different or novel categories (p. 1211).” Computed this way, disciplinary background breadth can range from zero to $(k - 1)/k$. It is zero or lowest when a leader has past experience just in a single discipline (i.e., no experience in other disciplines than hers). It is $(k - 1) / k$ or highest when a leader has past experience in all possible disciplines for an equal period of time.

To assess *transformational leadership*, Multifactor Leadership Questionnaire (Form 5X-short version, Bass & Avolio, 1995) was used to assess transformational leadership. The scale had 20 items in total (Cronbach’s $\alpha = .95$). Sample items are; “My team leader re-examines critical assumptions to question whether they are appropriate (intellectual stimulation),” “My team leader talks about his/her most important values and beliefs (idealized influence),” “My team leader talks enthusiastically about what needs to be accomplished (inspirational motivation),” and “My team leader considers me as having different needs, abilities and aspirations from others (individualized consideration).” Finally, *team commitment* was measured using a 5-item scale that is a shortened version of Bishop and Scott’s (2000) original scale. Sample items include; “I am proud to tell others that I am part of this team,” and “This team really inspires the very best in me in the way of job performance.” The reliability coefficient (Cronbach’s α) for this scale was .87.

Mediators and dependent variable. The two mediators (i.e., voice behavior and openness to voice) and the dependent variable (i.e., team member performance) were rated by peer team members in order to avoid common method bias (Podsakoff et al., 2003). First, participants were asked to list the names of all the team members. Then they were asked to evaluate each team member’s voice behavior, openness to voice and team member performance. *Voice behavior* was measured with a six-item scale from Van Dyne and LePine’s (1998) study. Sample items include; “This team member... develops and makes recommendations concerning issues that affect this

team,” and “communicates his/her opinions about work issues to others in this group even if his/her opinion is different and others in the group disagree with him/her.” *Openness to voice* was measured with a modified version of 5-item top management openness scale from Ashford et al. (1998). Some items included are; “This team member takes ideas from other team members into serious consideration,” and “This team member takes action on recommendations made from other team members.” Finally, *team member performance* was measured using a 4-item scale developed by McAllister (1995). Sample items are; “Overall, to what extent do you feel that this person is performing his/her total job the way you would like it to be performed?” and “To what extent has this person met all of your expectations in his/her roles and responsibilities?” The reliability coefficients (Cronbach’s α) for these variables were .92, .84, and .83, respectively.

Control variables. At the individual level, participants’ demographic characteristics such as age, gender, organizational tenure and position in organizational hierarchy that might influence individual voice behavior were controlled for (LePine & Van Dyne, 1998; Tangirala & Ramanujam, 2008b). Ethnic background was not included because the majority of South Korean population shares the same ethnic background. The numerical minority versus majority status of one’s discipline in the team was also controlled for as it affects team member performance as a team member (Randel & Jaussi, 2003). It was measured using a dichotomous variable in which minority membership is endowed if less than half of team members share one’s disciplinary background (0 = majority, 1 = minority). At the team level, team longevity, size and team diversity in disciplines were controlled for.

Aggregation Statistics

Individual scores of voice behavior, openness to voice and performance were computed by averaging the ratings from peer team members. Transformational leadership was computed

with an average score of team member ratings. To justify aggregation, I checked inter-rater agreement (i.e., r_{wg} , James et al., 1984) and reliabilities of these variables (i.e., ICCs, Bliese, 2000). The mean r_{wg} score was .87 for voice behavior, .89 for openness to voice, .88 for team member performance and .94 for transformational leadership, which indicates quite high inter-rater agreement for these variables. ICC(1) scores for these variables were .45, .24, .25, and .20, respectively, all of which were found significant in F tests ($F = 3.38, 1.91, 2.00, \text{ and } 2.94$, respectively, $p < .05$). This demonstrates that the within-individual variability was smaller than the between-individual variability in team member ratings on each of these variables. ICC(2)s were .70, .48, .50, and .66, respectively, indicating that individuals were reliably differentiated based on average peer ratings on these variables (Bliese, 2000).

Analytic Strategy

My research model includes cross-level relationships of individual-level and team (leader)-level variables. In addition, it is possible that my data violates the independence assumption as the data set is structured in a way that individuals are nested within teams (leaders). Hence, I tested my model with hierarchical linear modeling (HLM) using the software HLM 6.08 (Raudenbush & Bryk, 2002; Raudenbush, Bryk, & Congdon, 2004). HLM accounted for the potential non-independence in my dependent variables by partitioning their variances into level 1 (i.e., individual-level) and level 2 (i.e., team/leader-level) components. Level 1 variables included controls, disciplinary embeddedness and team commitment, and Level 2 variables included team-level controls, disciplinary hierarchy, transformational leadership, and leader disciplinary background.

According to Hofmann and Gavin (1998), group-mean centering in testing a cross-level mediation (i.e., 2-1-1 mediation like in the hierarchy-voice-performance relationship in my

model) does not allow between-group variance to be partialled out of the dependent variable. On the other hand, in grand-mean centering, between-group variance in the dependent variable is adjusted for the level-1 variables. In other words, grand-mean centering may produce more accurate estimates for this type of relationships. Therefore, the cross-level mediation (i.e., the 2-1-1 mediated relationship of hierarchy-voice-performance) was tested with grand-mean centering. All the level 1 variables including the control variables were grand-mean centered, except for categorical control variables (i.e., gender, minority membership, educational background, and organizational position) which were uncentered. In testing all other relationships including cross-level moderations, the level 1 variables were group-mean centered because grand-mean centering “confounds the cross-level interaction with the between group interaction (p. 631).” All the level 2 variables including the controls were grand-mean centered in all cases in order to avoid multicollinearity (Hofmann & Gavin, 1998).

Hypothesis 2 and 4 involve multilevel mediations. Typically, a single-level mediating effect is tested using Baron and Kenny’s (1986) procedure and/or Sobel test (1982), and a single-level mediated moderation is tested following Edwards and Lambert’s (2007) procedure. However, these techniques can produce inaccurate estimations with multilevel data (Bauer, Preacher, & Gil, 2006; MacKinnon, Lockwood, & Williams, 2004). Hence, I conducted the Monte Carlo Method for Assessing Mediation (MCMAM) to test these relationships using a web utility provided by Selig and Preacher (2008).

Chapter 5: Results

Descriptive statistics and reliabilities of the variables are reported in Table 1.

 Insert Table 1 about here

Main and Mediating Effects

Hypothesis 1 predicted a negative relationship between disciplinary embeddedness and openness to voice. To test this hypothesis, openness to voice was regressed on disciplinary embeddedness. As shown in Table 2, the effect of embeddedness on openness to voice was significant and negative, as expected ($\gamma = -.14, p < .05$). Therefore, Hypothesis 1 was supported.

In Hypothesis 2, it was expected that openness to voice may mediate the negative effect of embeddedness on team member performance. To test this, I first followed the 4-step procedure suggested by Baron and Kenny (1986). In Step 1, the effect of the independent variable (disciplinary embeddedness) on the mediator (openness to voice) should be significant, which was supported in Hypothesis 1 in my data set. In Step 2, the effect of the independent variable (disciplinary embeddedness) on the dependent variable (team member performance) should be also significant. As shown in Model 1 in Table 2, embeddedness did predict team member performance ($\gamma = -.17, p < .05$). In Step 3, the effect of the mediator (openness to voice) on the dependent (team member performance) should be significant, while, in Step 4, the effect of the independent variable (disciplinary embeddedness) is substantially reduced when they are put in the model together. As seen in Model 2 of Table 2, the final two criteria were also satisfied in my data set since embeddedness did not predict performance any longer whereas the effect of openness to voice was still significant ($\gamma_{emb} = -.02, p > .05$; $\gamma_{open} = 1.05, p < .05$), which suggests a full mediation effect. To confirm this mediation effect with multilevel data, I conducted the

MCMAM as suggested by MacKinnon et al. (2004). The confidence intervals did not include zero ([-.26, -.04], CI = 95%), which indicates that the mediating effect of openness to voice was statistically significant. Therefore, Hypothesis 2 was supported.

Hypothesis 3 involved a cross-level negative effect of disciplinary hierarchy on individual voice behavior. Table 2 shows that hierarchy did have a significant and negative cross-level main effect on voice behavior ($\gamma = -1.78, p < .05$). Hence, Hypothesis 3 was supported. I tested the mediating effect of voice behavior on the relationship between disciplinary hierarchy and team member performance proposed in Hypothesis 4 in the same way that I tested Hypothesis 2. In Step 1, the effect of the independent variable (disciplinary hierarchy) on the mediator (voice behavior) should be significant predictor, which was supported in Hypothesis 3 in my data set. In Step 2, the effect of the independent variable (disciplinary hierarchy) on the dependent variable (team member performance) should be also significant. As shown in Model 3 in Table 2, hierarchy did predict team member performance ($\gamma = -2.30, p < .05$). In Step 3, the effect of the mediator (voice behavior) on the dependent (team member performance) should be significant, while, in Step 4, the effect of the independent variable (disciplinary hierarchy) is substantially reduced when they are put in the model together. As seen in Model 4 of Table 2, the final two criteria were also satisfied in my data set since the effect of hierarchy on performance substantially decreased, although still significant, while the effect of openness to voice was still strong and significant ($\gamma_{\text{hierarchy}} = -1.09, \gamma_{\text{voice}} = .80, p < .05$), which indicates a partial mediation effect. To confirm the effect, I conducted MCMAM and found that the partial mediation effect was significant as the confidence interval did not include zero ([-2.52, -.57], CI=95%). Therefore, Hypothesis 4 on the mediation effect of voice behavior for the hierarchy-performance relationship was supported.

 Insert Table 2 about here

Moderating Effects

Hypothesis 5 regarded the cross-level moderating effect of transformational leadership on the relationship between disciplinary embeddedness and openness to voice. Hypothesis 5 was tested by regressing the slope of disciplinary embeddedness (i.e., the relationship between embeddedness and openness) on transformational leadership. Hypothesis 5 was tested simultaneously with Hypothesis 8 which predicted the single-level moderating effect of team commitment on the same relationship. To test Hypothesis 8, I first generated an interaction term of disciplinary embeddedness and team commitment at the level 1 and included it in level-1 HLM equation. The HLM results of simultaneous testing of these hypotheses are summarized in Table 3. The cross-level moderating effect of transformational leadership was not significant ($\gamma_{DE \times TFL} = .14, p > .05$). Therefore, Hypothesis 5 was not supported. The coefficient for the level 1 interaction term of embeddedness and team commitment also failed to acquire statistical significance ($\gamma_{DE \times TC} = -.09, p > .05$). Hence, Hypothesis 8 was neither supported. However, although it was not hypothesized in my research model, transformational leadership had a significant and positive cross-level main effect on openness to voice ($\gamma_{TFL} = .33, p < .05$).

 Insert Table 3 about here

Then I tested the moderating effects of leader disciplinary background breadth (Hypothesis 6) and transformational leadership (Hypothesis 7) on the relationship between disciplinary hierarchy and voice behavior. To test these single-level moderations (at the level 2), I generated two level-2 interaction terms (disciplinary hierarchy and leader background breadth, and disciplinary hierarchy and transformational leadership) and included them at the level-2

HLM equation. In Hypothesis 9, it was hypothesized that individual commitment to the team at level 1 moderates the cross-level effect of disciplinary hierarchy on voice behavior. However, such a relationship (i.e., a level 1 variable moderates a cross-level effect of a level 2 variable) cannot be tested in HLM normally. Thus, I tested Hypothesis 9 as if team commitment were a level 1 independent variable and disciplinary hierarchy were a level 2 moderator. In other words, I regressed the slope of team commitment (i.e., the relationship between team commitment and voice behavior) on disciplinary hierarchy. Table 3 summarizes the HLM results of simultaneous testing of these moderating effects. Hypothesis 6 did not receive support from the data as the moderating effect of transformational leadership was not significant ($\gamma = .46, p > .05$). Hypothesis 9 also failed to receive support as the coefficient for team commitment was not significant either ($\gamma = 1.07, p > .05$).

On the other hand, the moderating effect of leader disciplinary background breadth was positive and significant ($\gamma = 1.89, p < .05$). To check if the effect is in the direction that I expected, I plotted the interaction in Figure 2. As illustrated in Figure 2, the negative effect of disciplinary hierarchy became weaker when leader disciplinary background breadth was higher. Hence, Hypothesis 7 was supported. However, an unexpected finding should be noted that leader disciplinary background breadth had a negative main effect on voice behavior ($\gamma = -.92, p < .05$). This is also demonstrated in Figure 2; the overall level of voice behavior is higher when disciplinary background breadth is lower.

Insert Figure 2 about here

Additional Analyses

In addition to the relationships proposed in the research model, I tested several other relationships among the constructs that may deepen the understanding on the phenomena of interest.

The effects of disciplinary status. Although disciplinary hierarchy was indeed found to have significant effects on the outcome variables, it is plausible that where a person locates in the hierarchy (i.e., disciplinary status) may also matter in influencing individual behavior in multidisciplinary teams (DiTomaso, Post, & Parks-Yancy, 2007). Hence, I tested the main as well as the interaction effects of disciplinary status on the three outcome variables. As shown in Table 4, the main effects of disciplinary status on openness to voice, voice behavior and individual performance were all not significant ($\gamma_{openness} = -.04$, $\gamma_{voice} = -.01$, $\gamma_{performance} = -.06$, $p > .05$). The cross-level moderating effects of disciplinary hierarchy on status were also not statistically meaningful for all three outcome variables ($\gamma_{openness} = .29$, $\gamma_{voice} = .44$, $\gamma_{performance} = .52$, $p > .05$).

 Insert Table 4 about here

Disciplinary embeddedness and team commitment. Unexpectedly, I found a positive correlation between disciplinary embeddedness and team commitment ($r = .26$, $p < .05$, Table 1). To check how the two constructs are related to each other, I tested a curvilinear relationship between them with the same control variables with the original analyses (disciplinary hierarchy was also included as a control) by adding a squared term of disciplinary embeddedness at level 1. The regression coefficient for the squared term was not significant ($\gamma = -.01$, $p > .05$), which

means that there is no curvilinear relationship between disciplinary embeddedness and team commitment.

Discriminant validity among the outcome variables. The three outcome variables (i.e., openness to voice, voice behavior and team member performance) were rated by the same source (i.e., peer team members) and had quite high correlations with one another (see Table 1). To confirm that these three are empirically differentiated, I conducted a CFA. Specifically, I compared a 3-factor model assuming that the three variables are correlated but distinct, and a 1-factor model assuming that these are not distinct. The fit indices from the 3-factor model (χ^2 [87] = 322.569, CFI = .83, RMSEA = .14) were much better than those from the 1-factor model (χ^2 [90] = 546.444, CFI = .67, RMSEA = .20). This indicates that the three outcome variables are different enough from one another.

Chapter 6: Discussion

The purpose of my dissertation was threefold. First, by relying on institutional theory, I aimed at identifying two previously unknown barriers to successful performance of members on multidisciplinary teams –that is, disciplinary embeddedness and disciplinary hierarchy. The second purpose was to uncover the mediating mechanisms through which these two barriers interfere with team member performance. Finally, I sought to find resolutions to these barriers by identifying moderators that reduce their negative effects. From a data set from 138 members in 23 multidisciplinary research teams, I found that disciplinary embeddedness indeed reduced openness to voice, which in turn decreased team member performance. Disciplinary hierarchy also interrupted with individual voice behavior as well as team member performance, and the hierarchy-performance relationship was partially mediated by voice behavior. Although the moderating effects of transformational leadership and team commitment were not found significant, disciplinary background breadth of leader did weaken the negative effect of disciplinary hierarchy on voice behavior.

Theoretical Implications

My dissertation study makes several meaningful contributions to the literature on multidisciplinary teams. Most importantly, it discovered two barriers to successful performance of members of multidisciplinary teams that had not been explored in the past –that is, disciplinary embeddedness and hierarchy. This indicates that the perspective of institutional theory that defines multidisciplinary teams as multi-institutional teams makes unique addition to our knowledge on multidisciplinary teams. As mentioned in Chapter 1 and 2, multidisciplinary teams including cross-functional teams have been typically studied from the perspective of diversity. However, in my dissertation, it was found that disciplinary embeddedness and

hierarchy had significant influences on various individual behavior and performance over and beyond the effect of disciplinary diversity in teams. This implies that the degree of mere differences in team members' disciplinary background does not capture the full picture of multidisciplinary teams. In other words, even if there are similar levels of disciplinary diversity in two teams, for example, team member behavior could differ between them depending on the level of disciplinary embeddedness and hierarchy.

The finding of disciplinary embeddedness is analogous to Randel and Jaussi's (2003) finding that personal identity with functional background has negative influence on team member performance in cross-functional teams. The authors explained their finding that personal identity with functional background, or the degree of the perceived importance of one's functional background in personal identification, hinders performance of individuals as a team member because the construct is "self"-focused. I would reinterpret their result because considering functional background as an important source of personal identity does not necessarily mean a "self-focused" and "self-serving" tendency of an individual. Rather, their finding can be viewed as a result of high affective embeddedness.

As discussed in Chapter 2, in the diversity literature, disciplinary diversity has been categorized as a form of cognitive diversity as opposed to surface-level demographic diversity (Mannix & Neale, 2005). Diversity scholars then have applied different theoretical frameworks to in investigating these two types of diversity; social identity theory has been used for demographic diversity to suggest that demographic diversity negatively influences team processes and outcomes, and information processing approach for cognitive diversity to suggest that cognitive diversity benefits team processes and outcomes. My dissertation study, combined with Randel and Jaussi (2003), proposed and showed that cognitive diversity such as disciplinary

diversity is not “purely cognitive.” Due to affective attachment to the discipline of individuals, cognitive diversity could negatively function like demographic diversity as social identity theory would suggest.

My dissertation study makes additional contribution over Randel and Jaussi’s (2003) study as I showed that disciplinary embeddedness has more than just affective component in it. I conceptualized and empirically demonstrated that it is a multifaceted construct consisting of cognitive and normative components as well as affective, based on institutional theory. Difficulties resulted from cognitive embeddedness of multidisciplinary team members have been reported sporadically in broad ranges of academia, especially in various areas of science and technology in which multidisciplinary collaborations are increasingly frequent (e.g., Cott, 1997, 1998; Dobbs, 1987; O’Connor et al., 2003; Roederer, 1988; Stokols, Hall, Taylor, & Moser, 2008; Younglove-Webb, Thurow, Abdalla, & Gray, 1999). However, it was not long before when management scholars first recognized such difficulties. To my knowledge, Cronin and Weingart’s (2007) theoretical paper is one of the few recent attempts to investigate problems associated with cognitive embeddedness. In this paper, the authors proposed that members of multidisciplinary or cross-functional teams have different understandings on “what is the problem in this team,” which ultimately causes different approaches to problem solutions. These differences inevitably bring ineffectiveness and inefficiency in team functioning. My dissertation study provides evidence for their assertion by showing that disciplinary embeddedness including cognitive component negatively influences individual voice behavior and subsequent performance in multidisciplinary teams.

The normative component of disciplinary influence is also a new aspect of professionals in multidisciplinary teams that has not been thoroughly studied in the literature on such teams.

Although conformity that is conceptually similar to normative embeddedness has been vastly examined in the social psychology literature in a form of social influence (Cialdini & Goldstein, 2004; Kelman, 1958), the possibility that normative influence of one's discipline may interfere with desirable behavior and performance of team members whose disciplines vary in a team has not been brought forward. My finding of normative embeddedness shows that professionals tend to conform to their disciplinary influence regarding performance criteria and norms and feel uncomfortable if they are to violate them (i.e., to accept work procedures and ideas from other disciplines), which damages their performance as a team member. This may eventually block the synergistic effects of various disciplines that are expected from a multidisciplinary team where active integration and transfer of knowledge is required. Taken together, my dissertation study implies that the three components of disciplinary embeddedness are all critical determinants of individual behavior and performance and possibly team-level performance in multidisciplinary teams.

Disciplinary hierarchy was also found to affect voice behavior as well as team member performance (both directly and at the cross-level). This provides evidence that there indeed exists perceived status differences across various disciplines (or functions) in multidisciplinary teams. Further, I showed that there was at least organization-level agreement on the perception of status of each discipline. Consistent with institutional theory (Zukin & DiMaggio, 1990), the relatively high inter-rater agreement indices calculated with my alternative measure of disciplinary status in Chapter 4 indicates that differentiated disciplinary status is not just a within team phenomena but a phenomena at a higher level. In organizational settings, status and its differences have been studied mostly in association with minority versus majority (e.g., Kenworthy, Hewstone, Levine, Martin, & Willis, 2008), social membership such as gender and race (Ridgeway, 1991, 2001),

organizational position (e.g., Jackofsky & Peters, 1987; Martin et al., 2006) and level of expertness (Bunderson, 2003a; Van der Vegt, Bunderson, & Oosterhof, 2006). Although Jackson (1996) pointed out lack of studies on expertise-based status and status differences in teams, the deficiency has not been resolved so far. This study shows that disciplinary background is another source of status differences even among those who have a similar level of education or organizational position, as Jackson (1996) proposed. This indicates that treating disciplines equally in studying multidisciplinary teams like in the past diversity literature may produce inaccurate or insufficient knowledge on such teams. For example, individuals in two teams with a similar level of disciplinary diversity could show a totally different patterns of behavior if the teams have different degrees of disciplinary hierarchy. In this regard, studies on disciplinarily or functionally diverse teams should take status-related issues into consideration. Mixed findings on the functional diversity-team performance relationship may be resolved by introducing disciplinary hierarchy into the research model (Mannix & Neale, 2005; van Knippenberg et al., 2004; van Knippenberg & Schippers, 2007).

Although it was not hypothesized in the model, I also found that disciplinary hierarchy had a strong negative effect on openness to voice as well ($\gamma = -1.89, p < .05$). One potential explanation for this effect is that team members in a team with strong hierarchy among disciplines tend to reject new ideas and suggestions because they perceive them as illegitimate or inferior to the dominant logics and procedures. By definition, strong disciplinary hierarchy occurs when one or a handful of team members from the most privileged discipline monopolize the influencing power in the team. In such a situation, no matter how excellent a new idea, suggestion or information is, it is likely to be rejected at the end if it is from members of disciplines of lower disciplinary status. Repeating this experience may lead team members to

automatically pay no or little attention to new suggestions made in the team. In other words, they may be demonstrating a kind of “learned helplessness (Seligman, 1975).” Whatever the reason is, this negative effect of disciplinary hierarchy on openness to voice, combined with its other negative effects on voice behavior and team member performance, strongly suggests that disciplinary hierarchy is a critical phenomenon that a multidisciplinary team should resolve in order to maximize its potential. It is interesting, though, that disciplinary status had no effect at all unlike disciplinary hierarchy. This may indicate that team members were strongly influenced by some sort of team climate (James & Jones, 1974; Jones, James, Hornick, & Sells, 1979) induced by disciplinary hierarchy, but cared less about their disciplinary relative standing on the hierarchy. In other words, disciplinary hierarchy may generate shared implicit assumption regarding how they should interact with one another in the team at the team-level, which in turn determines team member behavior regardless of their disciplinary status within team. A future study needs to examine precisely how disciplinary hierarchy influences high versus low status team members differently.

In addition, my dissertation study further enriches the team literature by identifying the mediating mechanisms through which disciplinary embeddedness and hierarchy affect team member performance: openness to voice and voice behavior, respectively. My study shows that, in an environment where active learning is critical like a multidisciplinary team, openness to voice and voice behavior are important ways in which members make contributions to the team. In addition, these findings provide an explanation on *why* disciplinary embeddedness and hierarchy hinder team member performance in such teams.

Finally, my dissertation study demonstrated that leader disciplinary background breadth is an important leader attribute in multidisciplinary teams that decreases the negative effects of

disciplinary hierarchy. Except for a few studies (Bunderson & Sutcliffe, 2002; Cannella, Park, & Lee, 2008), the breadth of leader disciplinary or functional background has not been in the spotlight of team leadership studies. However, my finding indicates that it could be an important factor influencing team functioning especially in teams where past experiences in diverse areas are appreciated like in a multidisciplinary team (Angriawan & Abebe, 2011; Bunderson, 2003b; Haas, 2006; Huckman & Staats, 2011). In this sense, background breadth could be viewed as a source of expert power of leader (Finkelstein, 1992). Categorizing dimensions of power of leaders like top managers, Finkelstein (1992) proposed that expert power refers to leader ability of managing environmental contingencies and uncertainty. He suggested that leader past experience in diverse functional areas is definitely a source of expert power as it enables to deal with multiple stakeholders in- and out-side of the organization. Consistent with his assertion, my dissertation study demonstrates that team leaders with broad disciplinary background help team member to overcome the influence of strong structure (i.e., hierarchy) at a higher level (i.e., institutions).

However, this result should be interpreted with caution because, unexpectedly, the main effect of leader disciplinary background breadth on voice behavior was negative. This means that team members whose leader had a broader experience in diverse disciplines were inclined to make new suggestions and share information less. This might be because such leaders actively engage in the whole work processes of the team, rather than empower team members to work independently, as they have knowledge and skills in various disciplines. In such a situation, team members may not eagerly share their ideas and make suggestions due to loss of motivation (Crano & Chen, 1998). Or, it might be because team members get to psychologically depend on the expert power of the leader too much, rather than solve problems for themselves (Kark et al.,

2003) . These speculations need future academic investigation. These potential explanations make sense particularly in the cultural context of South Korea where the data collection site is located. Koreans are known to have high power distance, or tend to anticipate that power is unequally distributed (Hofstede & Bond, 1988). Since they are accustomed to defer and conform to an authority figure, they have a tendency to feel uncomfortable with empowerment (Robert, Probst, Martocchio, Drasgow, & Lawler, 2000). Therefore, Korean team members may have come to rely on leaders with expert power (i.e., leaders with disciplinary background breadth) very easily and remain silent even when they have different ideas and information.

Another finding that was not originally proposed in the research model was the positive main effect of transformational leadership on openness to voice. This can be interpreted in several ways. First, transformational leadership may promote team members' motivation for learning as it by definition gives intellectual stimuli to team members (Coad & Berry, 1998). Hence, team members with a leader high on transformational leadership may become more proactive in accepting new ideas and knowledge from others. In addition, team members may become more eager to get new information and ideas in order to achieve their goal because a transformational leader infuses intrinsic motivation and goal commitment for the task (Piccolo & Colquitt, 2006). These potential psychological mechanisms might be fruitful areas for future study.

The final unexpected and interesting finding is the positive correlation between institutional embeddedness and team commitment. This indicates that an individual who is highly embedded in her discipline also feels committed to her multidisciplinary team, which is counterintuitive. This is similar to Hekman and his colleagues' (Hekman, Bigley, Steensma, & Hereford, 2009; Hekman, Steensma, Bigley, & Hereford, 2009) finding of high correlations

between professional and organizational identification. This might be a reflection of certain types of personality traits. For example, individuals who have a trait “to be right” or “to be accepted” are inclined to conform to social groups (McDavid & Sistrunk, 1964). Those with high need for achievement are also likely to feel committed to any social group that they belong to (Steers, 1977). As the curvilinear relationship between disciplinary embeddedness and team commitment was found to be not significant, more investigation on this relationship is needed.

Practical Implications

The findings of my dissertation provide meaningful insights to the management and leaders of multidisciplinary teams. First, the negative effects of disciplinary embeddedness on openness to voice and subsequent team member performance suggest that staffing a multidisciplinary team needs a special attention. If a multidisciplinary team consists of members who are all strongly embedded in their discipline, it is likely that its members do not fully utilize cognitive resources from other members and thus fail to perform well because they would not listen to what others suggest and stick to their current knowledge and cognitive framework. Therefore, a member who has experience in various areas and is open-minded to new areas of knowledge and expertise may be more appropriate for a multidisciplinary team. Even if there are only a small number of such individuals, they can act like a change agent and induce necessary “paradigm shift (Kuhn, 1962)” in other team members’ mindset (Beckert, 1999; Greenwood & Suddaby, 2006; Maguire et al., 2004; Seo & Creed, 2002; Tracey, Phillips, & Jarvis, 2011).

Second, the mediating effect of openness to voice indicates that team members higher on disciplinary embeddedness tend to perform poorer because they tend not to listen to what others say. In this regard, it may be helpful to let them have formal as well as informal occasions where they can learn that combining knowledge and ideas from other disciplines indeed promotes their

own performance. For example, multidisciplinary or cross-disciplinary brown-bag sessions and seminars could help. Third, the mediating effect of voice behavior suggests that leaders of multidisciplinary teams with especially high disciplinary hierarchy may want to pay attention to encourage team members to actively exchange new ideas and suggestions with one another. Even though a team has strong disciplinary hierarchy, fostering team climate supportive for voice behavior might help reducing the negative effect of hierarchy.

Fourth, managers and team leaders should be aware that team members do perceive status differences in terms of their disciplinary background, and such perception negatively affects not only their voice behavior but performance. Therefore, they need to make an effort to alleviate such negative effect. For example, team leaders may want to pay careful attention to assign sufficient opportunity for speaking up equally across members of different disciplinary background, and promote a team atmosphere of openness to voice especially when members of low disciplinary status raise their voices (Maier & Solem, 1952). Finally, the moderating effect of leader disciplinary background breadth that I found suggests that staffing a team leader who has had worked in diverse areas can help teams with strong disciplinary hierarchy overcome its possible negative consequences. As leadership is more effective when followers perceive their leader competent and knowledgeable (Epitropaki & Martin, 2004), a leader who has understandings on diverse areas through past work experience and education and training is likely to be more effective in a multidisciplinary team where knowledge integration across different disciplines is required.

Limitations and Future Research Directions

Like any other studies, this study has some limitations which offer several directions for future research. First, despite its focus on multidisciplinary “teams,” it does not have team-level

outcomes in the research model. Although the negative effects of disciplinary embeddedness and hierarchy on individual-level outcomes imply that these two predictors are highly likely to interrupt with healthy team processes and successful team-level outcomes, this suspect needs to be empirically tested at the team. First, it needs to be tested if disciplinary embeddedness and hierarchy do hinder performance at the team level. Then, some team processes are to be identified to explain the relationship. Especially, as the ultimate purpose of a multidisciplinary team is knowledge integration, it would be worth investigating if embeddedness and hierarchy interrupt with the development of effective team cognition such as transactive memory (Wegner, 1987) and team mental model (Klimoski & Mohammed, 1994). Alternatively, team reflexivity, or the extent to which a team thinks over its current procedures and routines (Fay, Borrill, Amir, Haward, & West, 2006; Schippers et al., 2003; West, 1996) or cross-understanding, or the extent to which team members understand the mental models of one another (Huber & Lewis, 2010), could be another mediating mechanism for the effects of the two barriers.

Second, among the three moderators, only leader disciplinary background breadth was found to be a significant predictor in my dissertation study. As disciplinary embeddedness and hierarchy interrupt with successful performance of multidisciplinary team members, some remedies for these negative effects should be promptly identified in future research. One potential moderator is commitment to the multidisciplinary project, rather than to the team. In my research setting, team members typically engaged in several projects across the team boundaries. Although they worked with members of the multidisciplinary team on which they reported in the survey, they also worked with members of different research teams on other projects. Therefore, feelings of belongingness to the team may have had weaker influences over them. In this regard, commitment to the multidisciplinary research project or intrinsic motivation

for the project may have stronger influence on them than commitment to the team. Another potential moderator is organizational HR systems. My dissertation study concerns with-in team dynamics excluding broader environments such as organizations from the model. However, external environment has been shown to influence team dynamics in many ways (Hackman, 1987). Particularly, scholars in science and technology have pointed out that HR systems developed with uni-disciplinary research teams in mind could be very disadvantageous to and thus demotivating researchers in multidisciplinary research teams (O'Connor et al., 2003; Rhoten & Parker, 2004). In this regard, the moderating effects of HR systems such as performance evaluation and reward systems are worth to be examined.

In addition, I call for future research on effective leadership in multidisciplinary teams. Redefining multidisciplinary teams as multi-institutional teams, I focused on transformational leadership in this study as I saw many similarities between transformational leadership and institutional entrepreneurship. However, it was shown to be not effective as a moderator. This might indicate that team leadership that meets the special needs of multidisciplinary teams is more effective in reducing the negative effects of disciplinary embeddedness and hierarchy (Morgeson, DeRue, & Karam, 2010). In this regard, it might be fruitful to test more directly specific institutional entrepreneurship tactics that have been suggested to be effective in studies on institutional theory. For example, institutional theory emphasizes leaders' political skills and tactics that foster cooperation and association among social actors with different interests, and their abilities to frame their institutions attractive to a larger society (Garud, Jain, & Kumaraswamy, 2002; Levy & Scully, 2007; Maguire et al., 2004; Perkmann & Spicer, 2007). Researchers may want to examine how these types of leader behavior are related to disciplinary embeddedness and hierarchy.

Finally, some methodological issues should be noted. One is that the direct and indirect effects of disciplinary embeddedness tested with group-mean centering might be showing frog-pond effects (Firebaugh, 1980). In other words, the effects of disciplinary embeddedness may be in fact an effect of one's relative standing on disciplinary embeddedness within the team, not necessarily a general effect applicable to all individuals across teams. Therefore, the results of this study should be interpreted with this boundary in mind. Another methodological issue is that my measure of team member performance only regards individual's role-based contribution to the end product of the team. In other words, other types of team member performance including behavioral contribution and quality of individual contribution to the team discussed by Stevens and Campion (1994) are not considered in this study. Future research needs to examine the effects of disciplinary embeddedness and hierarchy on broader dimensions of team member performance.

Conclusion

It was already more than a decade ago when two executive administrators in science policy announced, "interdisciplinary research is a mantra of science policy (Metzger and Zare, 1999: 642)." However, the gap between the ideal and the reality of multidisciplinary teams has not been reduced even until now (Mannix & Neale, 2005; van Knippenberg & Schippers, 2007), due to lack of understandings on the potential barriers in such teams –that is, disciplinary embeddedness and hierarchy. This study provides a meaningful foundation for academic investigation on the two barriers. I hope that many future research inspired by my dissertation further enriches our understanding on multidisciplinary teams, and fundamentally help managers and researchers on such teams to produce better outcomes.

Tables and Figures

Table 1.

Descriptive Statistics and Correlations for Individual-level Variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Age	29.72	5.51	--										
2. Gender ^a	.33	.47	-.31*	--									
3. Educational background ^b	2.84	.71	.43*	-.03	--								
4. Team tenure	1.72	1.81	.31*	.13	.10	--							
5. Minority in disciplinary membership ^c	.64	.48	-.10	.06	-.08	.05	--						
6. Disciplinary embeddedness	3.46	.49	.11	-.06	.22*	.23*	-.05	(.72)					
7. Disciplinary status	3.15	.22	-.01	.10	.07	.09	.03	.20*	(.82)				
8. Team commitment	3.82	.74	.05	-.16	.04	.11	-.18*	.26*	.13	(.87)			
9. Voice behavior	3.88	1.11	.00	-.12	.06	.01	.02	.01	-.12	-.05	(.92)		
10. Openness to voice	3.88	.52	.10	-.10	.12	.04	-.04	-.07	-.01	.20*	.31	(.84)	
11. Team member performance	3.83	.60	.13	-.01	.14	.12	-.10	.04	.15	.24*	.35*	.78*	(.83)

Note. $N = 138$ team members; * $p < .05$; Reliability coefficients (alpha) are on the diagonal.

^a Gender: male = 0, female = 1.

^b Educational background: high school or lower = 1, bachelor's degree = 2, master's degree = 3, doctoral degree = 4.

^c Minority membership in disciplinary membership: majority = 0, minority = 1

Table 2.

Results of HLM Analyses for the Main and the Mediating Effects

Predictors	Openness to voice ^a	Voice behavior ^b	Team member performance			
			Model 1 ^c	Model 2 ^d	Model 3 ^e	Model 4 ^f
<i>Level 2</i>						
Intercept	4.36(.29)*	4.07(.75)*	4.06(.44)*	3.38(.34)*	4.15(.43)*	4.53(.36)*
Team size	.01(.02)	.07(.03)	.05(.03)*	.06(.04)	.03(.02)	.02(.01)
Team longevity	-.01(.02)	.03(.02)*	-.01(.03)	-.01(.02)	.01(.01)	-.01(.01)
Disciplinary diversity	-.73(1.14)	-.72(.64)	-1.51(1.26)	-1.51(1.43)	-1.00(.70)	-.33(.55)
Disciplinary hierarchy		-1.78(.49)*			-2.30(.36)*	-1.09(.41)*
<i>Level 1</i>						
Minority membership	.10(.11)	-.12(.13)	-.08(.14)	-.14(.06)*	-.09(.12)	-.09(.08)
Age	.02(.01)*	-.01(.02)	.02(.01)	-.00(.01)	.02(.02)	.02(.01)
Gender	-.11(.12)	-.46(.25)	-.04(.15)	.05(.08)	-.05(.14)	.08(.07)
Educational background	-.07(.07)	.08(.13)	-.03(.10)	.08(.08)	-.05(.10)	-.18(.10)
Organizational position	-.06(.03)*	.02(.03)	-.03(.05)	.03(.03)	-.03(.05)	-.05(.04)
Team tenure	-.01(.03)	-.01(.03)	.02(.03)	.03(.02)*	.00(.03)	-.00(.02)
Disciplinary embeddedness	-.14(.05)*		-.17(.08)*	-.02(.05)		
Openness to voice				1.05(.10)*		
Voice behavior						.81(.17)*

Note. $N = 138$ team members in 23 teams. Unstandardized estimates are reported with standard errors in parentheses.

* $p < .05$, Two-tailed test.

^{a, c, d} Level 1 variables were group-mean centered except for minority membership, gender, educational background and organizational position, which were uncentered. Level 2 variables were grand-mean centered.

^{b, e, f} Level 1 variables were grand-mean centered except for minority membership, gender, educational background and organizational position, which were uncentered. Level 2 variables were grand-mean centered.

Table 3.

Results of HLM Analyses for the Moderating Effects

Predictors	Openness to voice	Voice behavior
<i>Level 2</i>		
Intercept	4.34(.27)*	4.32(.86)*
Team size	.00(.01)	.05(.01)*
Team longevity	.01(.01)	.04(.02)*
Disciplinary diversity	-.75(.70)	-.65(.64)
Disciplinary hierarchy (DH)	-1.62(.38)*	-4.61(2.82)
Leader disciplinary background breadth (LDB)	-.07(.15)	-.92(.20)*
Transformational leadership (TFL)	.33(.12)*	.20(.12)
<i>Level 2 Moderations</i>		
DH × LDB		1.89(.78)*
DH × TFL		.46(.64)
<i>Level 1</i>		
Minority membership	.14(.12)	-.05(.15)
Age	.02(.01)	-.01(.02)
Gender	-.13(.11)	-.52(.27)
Educational background	-.07(.08)	.08(.14)
Organizational position	-.06(.03)*	-.03(.05)
Team tenure	.01(.03)	-.01(.03)
Disciplinary embeddedness (DE)	.20(.31)	
Team commitment (TC)	.33(.29)	-.23(.18)
<i>Level 1 Moderation</i>		
DE × TC	-.09(.08)	
<i>Cross-level Moderations</i>		
DE × TFL	.14(.10)	
TC × DH		1.07(.71)

Note. $N = 138$ team members in 23 teams. Unstandardized estimates are reported with standard errors in parentheses. Level 1 variables were group-mean centered except for minority membership, gender, educational background and organizational position, which were uncentered. Level 2 variables were grand-mean centered.

* $p < .05$, Two-tailed test.

Table 4.

Results of HLM Analyses for the Effects of Disciplinary Status

Predictors	Openness to voice		Voice behavior		Team member performance	
<i>Level 2</i>						
Intercept	4.41(.28)*	4.41(.31)*	3.97(.79)*	3.95(.79)*	4.07(.41)*	4.05(.44)*
Team size	.00(.01)	.01(.02)	.07(.03)	.08(.03)*	.04(.02)*	.05(.02)
Team longevity	.01(.01)	.00(.02)	.03(.01)*	.02(.01)	.01(.01)	.00(.01)
Disciplinary diversity	-.63(.85)	-.79(.79)	-.99(.63)	-1.14(.69)	-1.27(.75)	-1.39(.62)*
Team mean status		-.29(.14)		-.31(.16)		-.28(.16)
Disciplinary hierarchy (DH)	-1.76(.38)*	-2.03(.37)*	-1.82 (.53)*	-1.97(.50)*	-2.26(.32)*	-2.37(.33)*
<i>Level 1</i>						
Minority membership	.11(.12)	.13(.13)	-.11(.12)	-.07(.13)	-.06(.06)	-.02(.15)
Age	.02(.01)*	.02(.01)*	-.01(.02)	-.01(.02)	.02(.01)	.02(.01)
Gender	-.13(.12)	-.13(.12)	-.45(.23)*	-.43(.22)*	-.07(.13)	-.06(.13)
Educational background	-.06(.07)	-.06(.07)	.08(.16)	.08(.16)	-.03(.09)	-.03(.10)
Organizational position	-.06(.03)	-.06(.03)	.03(.03)	.03(.04)	-.03(.05)	-.03(.06)
Team tenure	-.01(.03)	-.00(.03)	-.03(.04)	-.02(.04)	.02(.03)	.03(.03)
Disciplinary embeddedness	-.12(.06)	-.12(.10)	-.09(.08)	-.09(.08)	-.15(.09)	-.16(.09)
Disciplinary status (DS)	-.04(.06)	-.04(.08)	-.01(.10)	-.03(.10)	-.06(.06)	-.08(.07)
<i>Cross-level Moderations</i>						
DS × DH		.29(.36)		.44(.42)		.52(.38)

Note. $N = 138$ team members in 23 teams. Unstandardized estimates are reported with standard errors in parentheses. Level 1 variables were group-mean centered except for minority membership, gender, educational background and organizational position, which were uncentered. Level 2 variables were grand-mean centered.

* $p < .05$, Two-tailed test.

Figure 1. Proposed research model

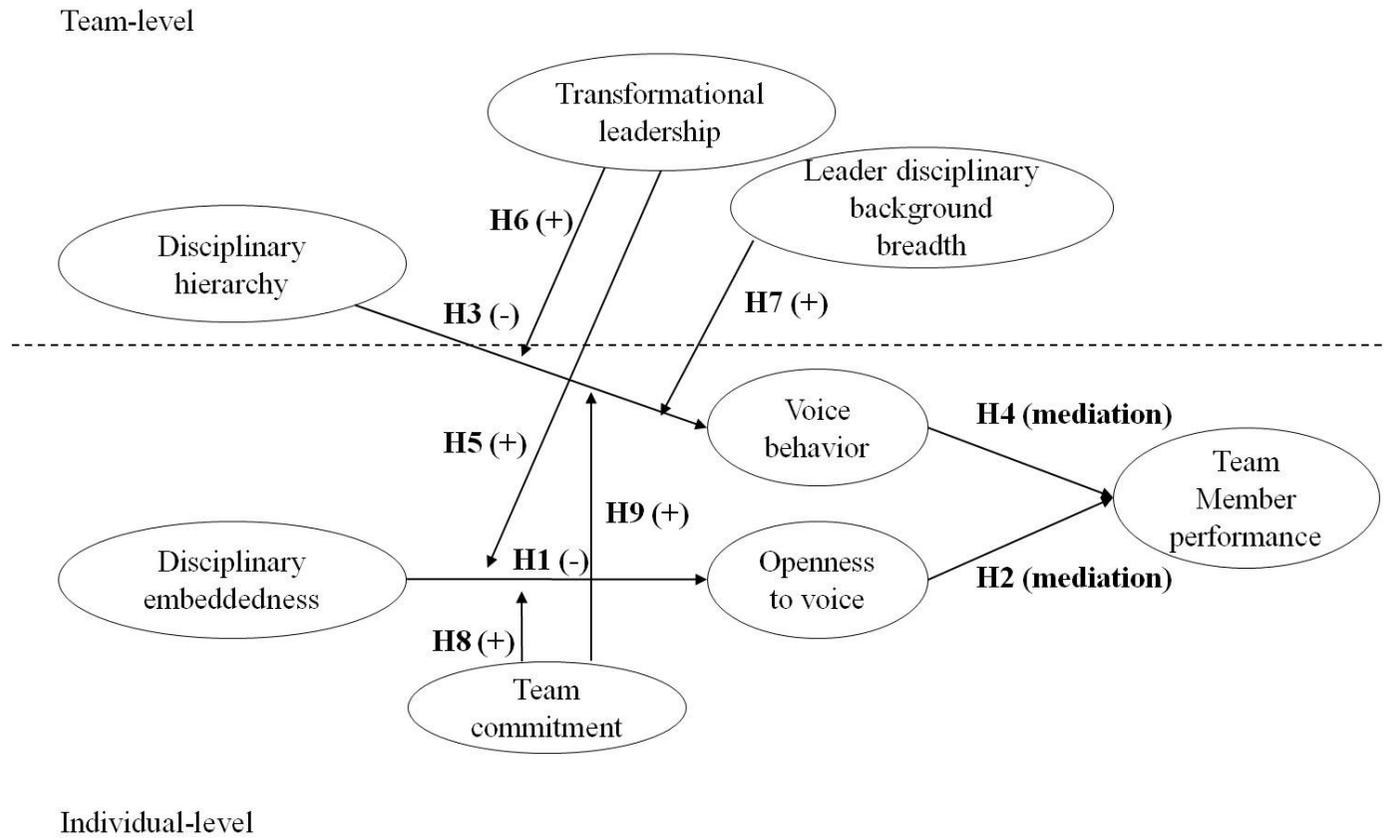
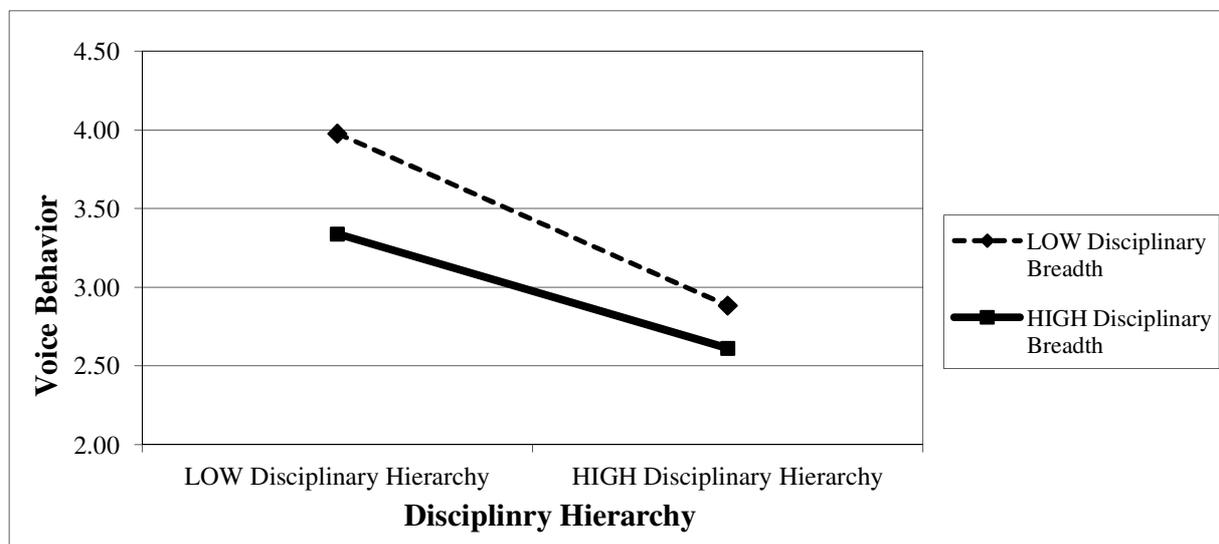


Figure 2. The moderating effect of leader disciplinary background breadth on the hierarchy-voice relationship



Appendix

Survey Measures

Disciplinary embeddedness

Cognitive component:

- 1) I am familiar with technical terms and idioms that are used only in my discipline.
- 2) I have been educated and trained to use specific thought processes that are encouraged to use in my discipline.
- 3) Sometimes it is difficult for me to think from the perspectives of other disciplines than my own.
- 4) I interpret things that happen in my team from the viewpoints of my discipline.
- 5) I believe that techniques, procedures and approaches of my discipline, rather than those of other disciplines, can be a major solution to the multidisciplinary research project of my team.

Affective component:

- 1) I am proud to tell others that I am a part of this organization.
- 2) I feel a sense of "ownership" for this discipline rather than being just a member.

Normative component:

- 1) I rarely engage in behavior that professionals in my discipline would not approve of.
- 2) It is important that other professionals in my discipline acknowledge the procedures and methods that I use in my job.
- 3) I strictly follow the performance standards that are set in my discipline.

Disciplinary status

- 1) When there are different viewpoints, logics and approaches to a problem across disciplines, those of my discipline are mostly adopted in my team.
- 2) When there are different viewpoints, logics and approaches to a problem across disciplines, it is more persuasive to use those of my discipline.
- 3) My discipline is regarded most privileged among others in my team.

Transformational leadership

Idealized influence:

- 1) My team leader instills pride in me for being associated with him/her
- 2) My team leader goes beyond self-interest for the good of the team
- 3) My team leader acts in ways that build my respect
- 4) My team leader displays a sense of power and confidence
- 5) My team leader talks about his/her most important values and beliefs
- 6) My team leader specifies the importance of having a strong sense of purpose
- 7) My team leader considers the moral and ethical consequences of decisions

- 8) My team leader emphasizes the importance of having a collective sense of mission

Individualized consideration:

- 1) My team leader spends time teaching and coaching
- 2) My team leader treats me as individuals rather than just as a member of the team
- 3) My team leader considers me as having different needs, abilities and aspirations from others
- 4) My team leader helps me to develop my strengths

Inspirational motivation:

- 1) My team leader talks optimistically about the future
- 2) My team leader talks enthusiastically about what needs to be accomplished
- 3) My team leader articulates a compelling vision of the future
- 4) My team leader expresses confidence that goals will be achieved

Intellectual stimulation:

- 1) My team leader re-examines critical assumptions to question whether they are appropriate
- 2) My team leader seeks differing perspectives when solving problems
- 3) My team leader gets me to look at problems from many different angles
- 4) My team leader suggests new ways of looking at how to complete assignments

Team commitment

- 1) I find that my values and the team's values are very similar.
- 2) I am proud to tell others that I am part of this team.
- 3) This team really inspires the very best in me in the way of job performance.
- 4) I am extremely glad that I chose this team to work with over other teams.
- 5) I really care about the fate of this team.

Openness to voice

- 1) Good ideas get serious consideration from this team member.
- 2) This team member is interested in ideas and suggestions from other team members
- 3) When suggestions are made in my team, this team member gives it fair evaluation.
- 4) This team member takes action on recommendations made from other team members.
- 5) This team member sometimes ignores good ideas from other team members (reversed).

Voice behavior

- 1) This team member develops and makes recommendations concerning issues that affect this team.

- 2) This team member speaks up and encourages others in this group to get involved in issues that affect this team.
- 3) This team member his/her opinions about work issues to others in this team even if his/her opinion is different and others in the team disagree with him/her.
- 4) This team member keeps well informed about issues where his/her opinion might be useful to this team.
- 5) This team member gets involved in issues that affect the quality of work life here in this team.
- 6) This team member speaks up in this team with ideas for new projects or changes in procedures.

Team member performance

- 1) Overall, this team member is performing his/her total job the way I would like it to be performed.
- 2) This team member has met all of my expectations in his/her roles and responsibilities.
- 3) I am satisfied with the total contribution made by this team member.
- 4) If I had my way, I would change the manner in which this team member is doing his/her job (reversed).

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