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Creativity in Groups

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CREATIVITY IN GROUPS

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RESEARCH ON MANAGING GROUPS AND TEAMS
VOLUME 12

CREATIVITY IN GROUPS

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PREFACE

Creativity is increasingly being recognized as an important source of competitive advantage because a single creative idea that is both novel and useful may take an organization in a profitable new direction. A long tradition of research has focused on individual creativity; especially the traits and social situations that make some people more creative than others. Over time, however, there has been a major shift in the way work is conducted such that organizations are becoming increasingly "team" based and employees are spending more time working as a member of a group. In line with this shift, research on creativity also moved from a focus on the individual to a focus on groups of people who collaborate to generate creative ideas. The growing interest in group creativity reflects an underlying assumption that the exchange of ideas that occurs in a group setting is more likely to result in a wider range of ideas that are more creative than any one person could have come up with alone. Although the evidence to support this assumption is somewhat mixed, there is a great deal of work yet to be done. Our goal in this volume is to promote the already burgeoning interest in group creativity by identifying new questions that will drive future research in this area.

Group creativity is both fascinating and challenging because it seems that most organizations are, by their very nature, designed to stamp out creative initiative. The prototypical organization emphasizes fitting in over standing out, conformity to the culture over independent thought and being liked over being different. This process results in the homogenized employee that Whyte called the "Organization Man" in his classic book. An optimist might argue that the employee-conformist was a victim of the technological revolution or some other "discontinuous" change that occurred over the last several decades. I say you can put his desk on wheels and dress him in business casual but the man in the gray flannel suit is alive and well in the modern organization. Look no further than a recent nationwide survey of American workers in which being a "team player" was ranked higher than job-related knowledge, skill, and abilities for advancement at work. I'll repeat: Being a team player is more important than knowing how to do your job. Therein lies the tension at the heart of this volume. How can groups preserve the cohesion, cooperation, and harmony that is (arguably) necessary for people to function effectively as a group, while at the same time encourage the independence and individual initiative that facilitates the expression of creative ideas? Barry Staw has written the capstone chapter and he will explore in more detail how this tension plays out in the volume as well as highlight themes across chapters and suggest opportunities for future research.

An important goal of this series is to provide a forum for junior scholars to develop their ideas and explore new research directions without the constraints that one would normally encounter at the journals. In keeping with this objective, a diverse set of scholars contributed chapters to this volume. Some have already made seminal contributions to this literature, some are just beginning an active program of research on group creativity and some have never written about group creativity before but have used this opportunity to make novel connections between this area and their own work. If previous volumes are any indication, the chapters you will read here are merely an introduction to what will most likely turn into an ongoing stream of research. Finally, consistent with the creativity theme, the authors benefited from a lively exchange of ideas that took place at the 12th Annual Conference on Research on Managing Groups and Teams held at Stanford University on April 25–26, 2008. The contributors and I are grateful to the series editors, Elizabeth Mannix and Margaret Neale for putting the conference together and for giving numerous and detailed comments on earlier manuscript drafts.

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WHAT *ARE* WE TALKING ABOUT, WHEN WE TALK ABOUT CREATIVITY? GROUP CREATIVITY AS A MULTIFACETED, MULTISTAGE PHENOMENON

Eric F. Rietzschel, Carsten K. W. De Dreu and Bernard A. Nijstad

ABSTRACT

Psychologists have created highly specific and elaborate models of the creative process and the variables affecting creative performance. Unfortunately, much of this research has tended to take either an overanalytical or an underanalytical approach. By overanalytical *we mean that researchers have studied single, isolated stages of group creativity, such as idea generation. By* underanalytical *we mean that researchers have tended to treat "creative group performance" as a single, unitary construct. However, we argue that it would be better to approach creativity as a multidimensional sequence of behaviors. In support of this argument, we discuss research on individual as well as group creativity showing that, firstly, there are multiple routes toward creative performance (e.g., flexibility and persistence), which may be pursued*

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alone or in combination. It is likely that these different routes are subject to distinct influences. Secondly, we argue and show that different stages of the creative process (problem finding, idea generation, idea selection, idea implementation) are not necessarily affected by the same variables, or in the same way. We highlight some new questions for research, and discuss implications for the management of groups and teams.

The importance of organizational teams for enhancing and maintaining an organization's creative potential and innovative performance is widely recognized. Innovation is considered to be of vital importance for economical growth and organizational effectiveness in today's rapidly changing world (e.g., Mahmood & Rufin, 2005; Patterson, 2002; West & Anderson, 1996). For example, several national governments have initiated programs to increase their country's innovativeness, including Canada (see www.innovation.gc.ca), the UK (see www.innovation.gov.uk), and The Netherlands (see www.innovatieplatform.nl). At the turn of the century, the European Union has even set the goal of making Europe the "most competitive and dynamic knowledge-based economy in the world," and sees innovation as "essential for European enterprises to be competitive" (Commission of the European Communities, 2000, p. 4). And because it is often taken as critical to innovation, we have seen a similar attraction to and valorization of creativity, both at the individual and the group level (for overviews, see Paulus & Nijstad, 2003; Zhou & Shalley, 2008).

Given the importance of creativity and innovation for organizational success, it is not surprising that researchers and practitioners alike have expended considerable efforts in uncovering the factors that contribute to, or hinder, creative performance. These include, among others, motivation (e.g., Collins & Amabile, 1999; Hennessey, 2003), work design (e.g., Elsbach & Hargadon, 2006), and group interaction (e.g., Nijstad & Stroebe, 2006; Paulus & Brown, 2003). Fruitful as such work may be, it carries some risk of creating the illusion that there is one "best" configuration of variables for creativity or innovation. In this chapter, we argue that no single situation can be seen as "best" for creativity and innovation, because both creativity and innovation involve multidimensional processes, unfolding over time. This conceptualization of creativity as a multifaceted, multistage phenomenon has important implications for the management of groups and teams. It suggests that managers need to be very specific in what exactly they wish to stimulate when they want to enhance "creativity," because a situation that might plausibly enhance one aspect of creativity or stage in the creative process might actually undermine another.

This chapter is organized around four sections. In Section 1, we begin with a critical review of the concept of creativity as it has been operationalized or defined in various literatures. We suspect that in many cases, an attempt to scientifically study creativity has led either to an overanalytical or an underanalytical approach. We give examples of each of these approaches. In Section 2 we give a short review of the dual pathway model to creativity (De Dreu, Baas, & Nijstad, 2008) as a possible way to predict different dimensions of creative output from different types of creative process. We discuss a series of studies from our own laboratories that tested parts of this model. In Section 3, we elaborate creativity as a process unfolding from a preparatory phase (in which the problem at hand is explored and relevant information is collected) to a divergent generative phase (in which potential solutions are generated) to a convergent testing and decision-making phase (e.g., Amabile, 1996; Nijstad & Levine, 2007; Wallas, 1926). We discuss our work on the way individuals select rather than generate ideas and insights, and thus highlight when and why this critical transfer from ideation to innovation takes place. Section 4, finally, summarizes our main conclusions, highlights avenues for future research, and discusses implications for management seeking to foster creativity and innovation in the workplace.

1. CREATIVITY: FROM COMPLEXITY TO SCIENTIFIC ANALYSIS

The complexity of creativity becomes obvious as soon as we begin talking about it, because the word itself is used with many different meanings, even within academic psychology. One distinction is that between *personal* (P) and *historical* (H) creativity (Boden, 2004). The difference lies in the standard of reference for what is to be judged as creative: one's own previous behavior or performance (P-creativity), or the collected previous behavior or performance of all humankind (H-creativity). Alternatively, there are the famous four P's of creativity (Rhodes, 1961): *person*, *process*, *product*, and *press*. Creativity can be seen as an individual difference variable (the "creative personality"; e.g., Feist, 1999, 2006; Mumford & Gustafson, 1988), as a property of certain cognitive processes or operations (e.g., Finke, Ward, & Smith, 1992), as some sort of quality criterion pertaining to a particular piece of work (e.g., Runco & Charles, 1993), or as a property of the environment in which behavior takes place (e.g., Csikszentmihalyi, 1996). This complexity notwithstanding, researchers have made enormous progress in understanding creativity. There are quite a number of elaborate models of creativity, many of which have in turn led to important insights into the creative process and the factors surrounding it. Unfortunately, however, we worry that many of these quite sophisticated models are to some extent either overanalytical or underanalytical, and thereby miss essential features of creativity.

Analysis, or dividing a thing into its component parts, is an essential tool for science. It is necessary to ask the question what components creativity has, and how these combine to form "creativity." However, identifying these components is not enough. What we mean when we state that some research appears to be *overanalytical* is that it focuses on one or only a few component(s) of the creative process, ignoring their interrelations with other components. An example is the work on idea generation, and particularly that on group brainstorming (e.g., Brown, Tumeo, Larey, & Paulus, 1998; Diehl & Stroebe, 1987). Whereas creative behavior cannot be understood properly if we do not understand how people generate creative ideas, idea generation is only a part of the creative process and (usually) not a goal in itself. A question which remains largely unaddressed by brainstorming research thus is how exactly the production of ideas contributes to creative solutions or innovations *after* the idea generation stage. And although it has rarely been the explicit aim of brainstorming research to answer such questions, the exclusive focus on idea generation becomes a problem when such research is broadly framed in terms of "group creativity," or when brainstorming research is cited to address the question whether groups are more (or less) creative than individuals. In fact, even if groups consistently generate fewer creative ideas than people working individually (which indeed is the case; see below), this does not automatically mean that groups are less creative, because there is much more to creativity than idea generation. Later in this chapter, we will take up this issue in more detail.

Conversely, when we state that some research is *underanalytical*, we mean that it approaches creativity as if it is a monolithic phenomenon, rather than a process or a collection of (sometimes radically different) components. For example, Woodman, Sawyer, and Griffin (1993) proposed a multilevel model of organizational creativity, in which links between individual, group, and organizational creativity are specified and different factors that might affect creativity at different levels are distinguished. Elegant and plausible as the model is, it does not explicitly distinguish between different stages or facets of creative performance (although the authors do note that such a distinction is important; for a similar example concerning innovation, see the distress–innovation–distress model by Anderson, De Dreu, & Nijstad, 2004). Likewise, Taggar (2002) proposed and tested a multilevel model of group creativity, showing that group creativity is a function of individual-level variables such as personality or cognitive ability, which affect group creativity through their effects on individual creative contributions, whereas team-level creativity-relevant processes affect the way in which individual contributions lead to group creativity. Again reflecting what we have termed an underanalytical approach, creative performance in this study was measured as a single, aggregated variable.

Thus, on the one hand we have research that recognizes the multi-component nature of creativity, but focuses on one of these components at the exclusion of others (an overanalytical approach), and on the other hand we have research that explains or predicts creative performance, but seemingly ignores its complex nature (an underanalytical approach). Although we believe that these studies and models are important and have greatly advanced our understanding of creativity, we suspect that it is time to explicitly study creativity as the multifaceted, multistage phenomenon it is.

2. A Dual Pathway Model of Creativity

The multifaceted nature of creativity is perhaps best illustrated by the fact that is usually analyzed into different components. Specifically, creativity researchers often operationalize creativity with measures of fluency, originality, and flexibility (Guilford, 1967; Torrance, 1966). *Fluency* is a measure of creative production and refers to the generated number of nonredundant ideas, insights, problem solutions, or products. *Originality* is one of the defining characteristics of creativity and refers to the uncommonness or infrequency of the ideas, insights, problem solutions, or products that are being generated (Amabile, 1996; Guilford, 1967; Paulus & Nijstad, 2003; Sternberg & Lubart, 1999; Torrance, 1966). *Flexibility* as a measure of creativity manifests itself in the use of different cognitive categories and perspectives, and the use of broad and inclusive cognitive categories (Amabile, 1996; Mednick, 1962).

Although fluency, originality, and flexibility all are considered to be dimensions of "creative performance," this does not mean that they are necessarily highly correlated. Fluency and originality may be correlated (e.g., quantity breeds quality; Diehl & Stroebe, 1987; Osborn, 1963), but they need not be. For example, creative fluency may manifest itself in a relatively large number of solved insight or perception problems, with the solutions themselves not being particularly new or uncommon (cf. Förster, Friedman, & Liberman, 2004). Moreover, states or traits that influence creative fluency do not necessarily also influence originality, and vice versa. A high flexibility will, all other things being equal, be associated with more ideas overall (i.e., increased fluency; cf. Nijstad, Stroebe, & Lodewijkx, 2002) as well as with the generation of ideas in categories that are not usually thought of (i.e., originality; cf. Murray, Sujan, Hirt, & Sujan, 1990; see also Isen & Daubman, 1984; Mikulincer, Paz, & Kedem, 1990).

The complexity of creativity thus can be partly deduced from the fact that it can be measured on several, potentially unrelated, dimensions. But it goes further than that. This becomes clear when one considers that flexibility, besides being a measure of creative performance, also refers to a cognitive process. Many researchers have argued that in order to be creative (i.e., to produce novel and appropriate products; see also later in this chapter) people must think flexibly, "break set" (e.g., Duncker, 1945; Smith & Blankenship, 1991; Smith, Ward, & Schumacher, 1993), and need flat associative hierarchies (e.g., Eysenck, 1993; Mednick, 1962; Simonton, 1999) to arrive at uncommon and disparate (and thus original) associations. Cognitive flexibility can thus not only be seen as a measure of creativity, but also as a precursor to the production of many (fluency) and original responses.

However, flexible thought is not the only way to generate creative ideas or solutions. It is also possible to achieve creative fluency and originality through hard work, perseverance, and the more or less deliberate, persistent, and in-depth exploration of a few cognitive categories or perspectives (Amabile, 1996; Boden, 1998; Dietrich, 2004; Finke, 1996; Simonton, 1997; Schooler, Ohlsson, & Brooks, 1993). Perseverance will not manifest itself in the use of many or broad cognitive categories, but rather in the generation of many ideas within a few categories or in longer time-on-task. All other things being equal, generating many ideas in a few categories will also lead to more ideas overall (i.e., fluency; Nijstad et al., 2002). Furthermore, our own work, which we review in detail below, suggests that fluency within categories is associated with originality of ideas within these categories: because only a limited number of conventional and unoriginal ideas are possible in each category, perseverance within categories eventually leads to original ideas (Rietzschel, Nijstad, & Stroebe, 2007). Such *within-category fluency* (e.g., Nijstad et al., 2002; Nijstad, Stroebe, & Lodewijkx, 2003; Nijstad & Stroebe, 2006) can be illustrated with the example of an individual who generates ideas as to how to improve health. This person may think about physical exercise and sport, and start out with common ideas like "people should spend more time doing physical exercise." However, provided he or she continues generating ideas within this category, he or she might proceed to more unusual ideas within that category like "putting a strong spring in your computer keyboard to make typing very hard work." In previous work where both flexibility (number of categories used) and within-category fluency were established, no systematic correlation between the two was observed (Nijstad et al., 2002, 2003), which suggests that these are independent measures of creative behavior.

Taken together, then, creativity can be achieved through enhanced cognitive flexibility, set breaking, and cognitive restructuring, which manifests itself in the use of many, broad, and inclusive cognitive categories. It can equally well be achieved through enhanced persistence and perseverance, which manifests itself in a higher number of ideas and insights within a relatively low number of cognitive categories, prolonged effort, and relatively long time-on-task. This may apply to idea generation and divergent thinking tasks. It may also apply to insight tasks that are typically characterized by being ultimately soluble by the average problem solver, likely to produce an impasse and a state of high uncertainty as to how to proceed, and eventually producing a kind of "aha" experience when the impasse is suddenly overcome and the solution is discovered after prolonged efforts at solution (Förster et al., 2004; Schooler et al., 1993).

This dual pathway model to creativity is represented in Fig. 1. It suggests that personality traits (P_i) and situational characteristics (X_i) alone or in combination may influence creativity through their effects on either

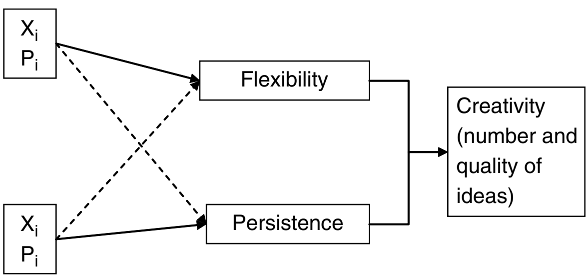

Fig. 1. The Dual Pathway Model to Creativity. *Note:* Environmental conditions (X_i) and personality traits (P_i) have their effects on either flexibility of cognitive processes or on persistence. Flexibility and persistence alone and in combination lead to creative responses.

flexibility or persistence. Importantly, some factors may mainly affect the flexibility pathway, whereas others may mainly affect the persistence pathway. In the remainder of this section, we discuss two series of studies that illustrate and support this dual pathway model. While these studies have been carried out at the individual level, there are some indications that group creativity may also come about through either the flexibility or persistence pathways.

2.1. Need for Structure and Creative Performance

Creativity is often associated with chaos, or at least with a lack of constraints. In line with this perspective, research has found that creative individuals often are those individuals that prefer complex over simple stimuli (Barron, 1953), who score high on the Big Five trait Openness to Experience (McCrae, 1987), and who are not particularly aversive to ambiguous situations (e.g., Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; Chirumbolo, Mannetti, Pierro, Areni, & Kruglanski, 2005). However, there are findings that strongly suggest a beneficial effect on creativity of moderate constraints and structure (Coskun, Paulus, Brown, & Sherwood, 2000; Dennis, Valacich, Connolly, & Wynne, 1996; Rietzschel et al., 2007). Thus, creative individuals often are those people who are able to deal effectively with ill-structured situations, but this does not necessarily mean that creative thought always benefits from a lack of structure. This apparent contradiction might be solved by taking into account the different routes towards creative performance.

As an example of this approach, consider a study in which we (Rietzschel, De Dreu, & Nijstad, 2007) looked at the interactive effect of two personality characteristics (need for structure and fear of invalidity) on creative performance. Need for structure is defined as a chronic aversion to ill-structured situations and a longing for certainty and predictability, while fear of invalidity refers to a fear of making invalid judgments and decisions and is associated with anxiety and worries about the correct response (Thompson, Naccarato, Parker, & Moskowitz, 2001; see also Neuberg & Newsom, 1993). Because need for structure is associated with rigidity of thought and lower flexibility (Neuberg & Newsom, 1993), it would seem logical to expect that need for structure negatively relates to creativity. However, we hypothesized that need for structure would associate positively with persistence (and therefore also with creativity), but only when fear of invalidity is low. When a high need for structure is accompanied by a high fear of invalidity, participants should find it hard to focus properly on the problem at hand, because fear of invalidity would induce them to keep switching problem representations; creative performance should therefore suffer. In contrast, when fear of invalidity is low, participants' need for structure might allow them to focus more effectively on a task or problem, and thereby stimulate creative performance through increased persistence.

Three different samples of participants performed three different tasks: an idea generation task (generating ideas about the "education" problem), a drawing task (drawing an alien), and a categorization task (Carnevale & Probst, 1998; Isen & Daubman, 1984; Rosch, 1975). Hence, creativity was assessed through productivity (number of generated ideas), originality (novelty of generated ideas and originality of drawings), and flexibility (inclusiveness). The results showed that, as predicted, fear of invalidity moderated the effect of need for structure, so that need for structure negatively affected creativity only when fear of invalidity was high; when fear of invalidity was low, need for structure actually led to higher creative performance. Importantly, however, this effect *only* occurred for originality and fluency; flexibility was not affected.

We hypothesized that these different effects reflected something about the underlying process, and that need for structure and fear of invalidity interactively affected participants' *cognitive perseverance*: participants with high need for structure and low fear of invalidity presumably managed to engage in deeper exploration of their knowledge base, and hence managed to generate more, and more original, ideas (as well as more original drawings). This hypothesis was supported by the results of another study (using a brainstorming task), where we replicated the interactive effect of need for structure and fear of invalidity on fluency and originality, and found that the effect was mediated by participants' within-category fluency (i.e., the mean number of ideas per semantic category). Again, flexibility (this time assessed as the number of semantic categories used) was not affected.

What is important about these results, is not just that originality and flexibility may not always be affected by the same variables, but also that it is possible to make and test specific predictions as to when or why this difference will occur, and that this increases our understanding of the creative process. Clearly, need for structure is related to rigidity of thought and blocks the flexibility route in the dual pathway model. However, it does not block the perseverance route. As long as fear of invalidity is low, people with high need for structure persevere at their (creativity) task and perform relatively well.

2.2. Mood and Creative Performance

Failing to explicitly distinguish between the different routes through which creative performance may be achieved can lead to conflicting results. A case in point is the literature concerning mood effects on creativity. Previous research had shown different effects of hedonic tone (i.e., positive vs. negative moods) on creative performance (e.g., Ashby, Isen, & Turken, 1999; Shalley, Zhou, & Oldham, 2004). To explain these different findings, De Dreu et al. (2008) distinguish between the *activating* or *deactivating* effects of different mood states (Barrett & Russell, 1998; Gray, 1982; Watson, Clark, & Tellegen, 1988). Activating moods can be positively (e.g., feeling happy or elated) or negatively toned (e.g., anger, fear); similarly, deactivating moods can have positive (feeling calm or serene) or negative (sadness, feeling down) hedonic tone.

According to the dual pathway model, both positive and negative activating moods lead to higher creative performance than deactivating moods, but *why* this is the case depends on hedonic tone: positive activating moods lead to higher creativity through cognitive flexibility, while negative activating moods stimulate creativity through perseverance. This idea was tested in a number of experiments by bringing participants into a particular mood (e.g., anger, sad, happy, or serene), and then asking them to perform a task assessing one or several components of creativity. Experiments 1–3 showed that participants in activating mood states (i.e., participants who felt angry, anxious, happy, elated, etc.) produced more ideas, were more original, more inclusive in their thinking, and solved more perceptual insight problems than participants in deactivating mood states (who felt sad, feeling down, relaxed, serene, etc.). The full test was provided by Experiment 4, in which, prior to the experimental task, participants answered a series of questions about their current mood. Participants then individually engaged in a brainstorming session. Afterwards, all ideas were counted (to measure fluency), coded for originality, and classified into semantic categories. To measure cognitive flexibility, the researchers counted the number of semantic categories used by each participant. Perseverance was operationalized as within-category fluency (i.e., the number of unique ideas generated by a participant divided by the number of categories used by that participant).

As expected, overall fluency (the total number of generated ideas) was enhanced by both positive and negative activating moods (as compared to deactivating moods). Moreover, the effect of *positive* activating moods was fully mediated by flexibility, whereas the effect of *negative* moods was fully mediated by perseverance. While participants who felt happy or elated generated more ideas because they used more different semantic categories, participants who felt angry or worried generated more ideas because they thought more deeply *within* semantic categories.

2.3. Summary and Discussion

The studies on need for structure by Rietzschel and colleagues (2007), and on mood by De Dreu and colleagues (2008) provide some counter-intuitive insights. People who score high on need for structure may be more creative than those who score lower (provided they have low fear of invalidity). And people who feel angry may be more creative than those who feel relaxed and serene. These counter-intuitive findings are consistent with the dual pathway model to creativity, and would not have been obtained when we had taken an overanalytical approach and, for example, focused on cognitive flexibility and set breaking only. Nor would we have obtained these findings had we taken an underanalytical approach, and lumped together measures of flexibility, fluency, and originality. In fact, only by decomposing creative outputs into number of ideas and insights and originality of ideas and insights, and creative processes into flexibility and perseverance, were we able to understand why highly structured people can be creative (because they persevere) and why angry people are as creative as happy ones (because of, respectively, perseverance and flexibility).

The results presented in this section were obtained with individuals performing different types of creativity tasks. It is important to establish whether similar results might be obtained when people work in groups. For example, do mood and need for structure affect group creativity in the same way as they affect individual creativity? Do different group level variables relate differentially to the flexibility or persistence pathway? Although research is relatively scarce, some work has been done that sheds light on these types of issues. For example, Chirumbolo et al. (2004) found that high levels of need for closure were associated with lower levels of group creativity, and that conformity pressures within the groups mediated this effect. To some degree this is consistent with our findings: we found a negative effect of need for structure when fear of invalidity was high. Conformity pressures may undermine group creativity in the same way that fear of invalidity undermines individual creativity. Further, Diehl (1991; see also Stroebe & Diehl, 1994) performed an experiment in which he manipulated group diversity in a brainstorming session. He found that groups in which members differed in the dominant (most accessible) associations to the topic of the brainstorming session (diverse groups) outperformed groups in which group members had similar dominant associations (homogeneous groups). Importantly, this effect was caused by increased flexibility: more categories of ideas were surveyed by the diverse as compared to the homogeneous groups. It therefore appears that group diversity mainly impacts group creativity through the flexibility pathway.

To conclude, more studies are clearly needed to test our dual-pathway model at the group level. It would indeed be of theoretical and practical importance to know which (individual and group level) variables influence flexibility and persistence at the group level. We will provide some suggestions in the discussion section of the chapter.

3. FROM CREATIVITY TO INNOVATION

The dual pathway model to creativity discussed in the previous section captures much of the creativity process leading to the production of creative ideas, insights, or problem solutions. It does little, however, to illuminate how such creativity turns into innovations, with ideas being selected, checked against external constraints or demands, and possibly implemented. To give but one example of how creativity may or may not turn into innovation, consider the study by De Dreu and West (2001) on the influence of minority dissent and participatory decision-making in team innovation. Based on laboratory experiments by Nemeth and colleagues (e.g., Nemeth, 1986) they argued that minority dissent in teams would trigger divergent, flexible thinking among majority members. Such divergent thinking would lead to new ideas and insights, which could transform into innovations. However, this will only happen if the team works together, to sift good from bad ideas and to obtain the social support needed to successfully implement novel ideas and solutions. Thus, the authors argued, minority dissent leads to innovation especially when teams are high in participative decision-making. This is indeed what their results showed.

Despite the prevalence of stage-based models and theories of creativity (e.g., Amabile, 1996; Osborn, 1963; Parnes, 1992; Wallas, 1926), few studies have explicitly addressed the different stages, their differences, and the way in which they are linked. Within the creativity literature, the usual course of action is to either study one of these stages in isolation (very often idea generation; see e.g., Diehl & Stroebe, 1987; Paulus & Dzindolet, 1993; Shalley, 1991), or to use tasks in which all or some of these stages are combined (such as creating a finished product, e.g., Amabile, 1979, or solving a problem or puzzle, e.g., Friedman & Förster, 2001). While such research is highly interesting and yields important insights, it leaves many essential questions about the sequential nature of creativity unanswered. Are all stages affected by the same environmental or personal factors? Is group interaction equally useful (or detrimental – see below) in all of these stages? Does good performance in one stage automatically carry over into the next stage? Such questions need to be addressed if we are to answer the overarching question of how creativity and innovation can be stimulated.

3.1. Idea Generation Versus Idea Selection

Recently, researchers have begun to pay more attention to the temporal dynamics of creativity and innovation. For example, following Gersick's (1988, 1989) punctuated equilibrium model, Ford and Sullivan (2004) proposed that group members' receptivity to novel ideas is dependent on the phase that the group is in. Before and during Gersick's midpoint transition (i.e., approximately midway the group's life), group members are expected to be relatively open to novel ideas, whereas this openness should decrease radically once the midpoint transition is past and the group is working toward task completion (see also Chirumbolo et al., 2004; Kruglanski & Webster, 1991).

Another example of a temporal perspective on group creativity and innovation comes from West, Sacramento, and Fay (2005), who argue that external demands are detrimental for team creativity, but conducive to team innovation implementation. The reasoning is that creativity (here: the generation or development of new ideas) requires an open and unconstrained environment (see also Anderson & West, 1998), whereas innovation (here: the application or implementation of new ideas) often is a direct response to stressful conditions (e.g., Bunce & West, 1995; West, 1989).

A more detailed illustration of how important it is to take the sequential nature of creativity into account may be given in the context of *brainstorming*, a classic and very popular creativity technique (Osborn, 1963). In a brainstorming session, participants are instructed to generate as many ideas as they can, without fear of evaluation or criticism. The main principle behind the brainstorming procedure is that *quantity breeds quality*;

in other words, the more ideas one generates, the better. In the words of Osborn (1963), father of the brainstorming procedure:

> It is almost axiomatic that quantity breeds quality in ideation. Logic and mathematics are on the side of the truth that the more ideas we produce, the more likely we are to think up some that are good (p. 131).

Thus, in brainstorming there should be a correlation between total ideational output and ''high-quality'' output, such that those individuals or groups that generate the most ideas, also generate the highest number of good ideas (with good ideas usually defined as ideas that score high on both originality and feasibility). Research has shown that this is indeed the case (Diehl & Stroebe, 1987; Parnes & Meadow, 1959; Rietzschel, Nijstad, & Stroebe, 2006).

Brainstorming often takes place in groups; indeed, it is often thought to be a group technique exclusively, although it can very well be done individually. It is commonly assumed that group brainstorming leads to higher productivity than individual brainstorming (such as in nominal groups, where people work individually but their ideas are pooled afterwards) (e.g., Paulus, Dzindolet, Poletes, & Camacho, 1993), but by now it is well-established that the opposite is the case (see Diehl & Stroebe, 1987; Lamm & Trommsdorff, 1973; Mullen, Johnson, & Salas, 1991, for overviews). This production loss in brainstorming groups (i.e., the finding that people produce fewer ideas and fewer ideas when they work in a group as compared to when they work individually) is partly due to some social factors, such as social loafing (Diehl & Stroebe, 1987) and social inhibition (Camacho & Paulus, 1995; Collaros & Anderson, 1969). However, the most important cause appears to lie in *production blocking*: When group members have to listen to each other's ideas, and have to wait for other members to stop speaking before they can express their own ideas, cognitive interference inhibits idea generation (Nijstad & Stroebe, 2006; Nijstad et al., 2003).

The production loss encountered by brainstorming groups is considerable, so a plausible conclusion would be that group brainstorming should not be used, because it leads to fewer ideas than individual brainstorming (e.g., Stroebe & Diehl, 1994). However, such a recommendation would be premature. What is not always made explicit, but nevertheless is part and parcel of brainstorming, is the assumption that quantity not only breeds quality *during*, but also *after* brainstorming. In other words, it is presumably useful to generate high-quality ideas, because (at least some of) these ideas will be recognized, selected, and implemented. The more ideas one generates, the more good ideas (i.e., highly original and feasible ideas) one generates, and the higher the probability that high-quality ideas will be implemented. This implies a correlation between ideational output in the brainstorming stage and the quality of the ideas that are selected after brainstorming: groups or individuals that are more productive should select better ideas (because more good ideas are available to them). A number of studies by Rietzschel, Nijstad, and Stroebe (2006, 2008, in press) addressed precisely this issue. Below, we will describe and discuss some of these studies.

Rietzschel et al. (2006; see also Faure, 2004; Putman & Paulus, in press, for similar studies) had participants engage in a brainstorming session, followed by an idea selection task. Throughout the task, participants (undergraduate psychology students) worked either in three-person groups (interactive groups), or individually in three separate cubicles (with their output being pooled afterwards; nominal groups). In the brainstorming session, participants generated ideas about the question "how can education at the Psychology department be improved?" After the brainstorming sessions, all groups/individuals were instructed to select the best ideas from their production. All generated and selected ideas were later rated for originality and feasibility.

The results were striking: as expected, nominal groups generated significantly more ideas than interactive groups, but this difference in productivity had no effect whatsoever on the quality (i.e., originality and feasibility) of the selected ideas. In fact, productivity was not correlated with the quality of selected ideas at all. Even though the most productive brainstormers also generated higher numbers of highly original and feasible ideas than other participants, this did not lead to their selecting better ideas. Moreover, analyses showed that selection *effectiveness* (the degree to which participants actually selected their best ideas according to the ratings) was very low across both conditions: on the whole, participants' selection performance did not exceed chance level. Clearly, the generation of creative ideas in itself is not sufficient to guarantee that creative ideas also get selected and implemented.

Rietzschel et al. (in press; Experiment 1) performed new experiments to further investigate these initial findings. In the first study, which again consisted of a brainstorming task followed by an idea selection task, half of the participants (who in this and the next study all worked alone) were provided with explicit selection criteria to use during idea selection (after a brainstorming session); these participants were instructed to select ideas that were both original and feasible (whereas the other participants were simply instructed to select the 'best' ideas). After these tasks, participants were asked about their selection criteria and satisfaction with the process.

As in the first study, there was no correlation between productivity and quality of the selected ideas. Moreover, selection effectiveness again did not exceed chance level, and selection criteria had no effect on selection effectiveness. Interestingly, however, participants who were instructed to select original and feasible ideas were less satisfied with their selection than participants who were instructed to select "the best" ideas. Furthermore, there was a significant negative correlation between participants' motivation to select original ideas and their motivation to select feasible ideas. Apparently, participants found it difficult to take originality and feasibility into account simultaneously; this could explain why these selection criteria did not lead to better selection performance.

Another study (Rietzschel et al., 2008) further addressed the issue of selection criteria and the link between idea generation and idea selection. In this study, participants generated and selected ideas (again, the "education" topic was used), but half of the participants were instructed to be as creative as possible in both tasks (e.g., Harrington, 1975; Shalley, 1991), whereas the other participants were instructed to keep their experiences as students in mind. It was expected that these creativity instructions would not be perceived to be contradictory (as the combination of originality and feasibility apparently was), and that this would improve performance, particularly during idea selection. Furthermore, the scope of the brainstorming problem was manipulated: half of the participants generated ideas about improvements in education at the psychology department (broad problem), whereas the other participants generated ideas about improvements in the *lectures* at the psychology department (narrow problem). The expectation was that a narrow problem should facilitate the generation of original ideas (Dennis et al., 1996; Rietzschel et al., 2007), which should allow the researchers to test whether differences in creative idea generation would carry over into idea selection.

Creativity instructions improved selection performance: participants with creativity instructions selected ideas of higher quality (i.e., higher originality, without lower feasibility) than did participants without creativity instructions. Moreover, participants with creativity instructions managed to exceed chance level in their selection effectiveness. However, as in the earlier studies, participants with creativity instructions were less satisfied about their idea selection, despite their better performance. Apparently, the instruction to select creative ideas led them to select ideas that they thought were not their best ideas. Problem scope had the expected effect on idea generation: a narrow problem led to the generation of more original ideas. However, this had no effect on idea selection.

In our view, these studies have two important implications. Firstly, idea generation and idea selection are affected by different variables. Factors that affect idea generation, such as group interaction or problem scope, had no effect on idea selection. In contrast, idea selection was only affected by factors that specifically concerned the selection task (i.e., specific selection criteria). Secondly, these results demonstrate that performance in one stage of the creative process (i.e., idea generation) does not necessarily carry over into the next stage (i.e., idea selection). In other words: better performance in one stage of the creative process does not necessarily lead to better performance in another stage. In fact, it is even worse: good performance in one stage can be completely undone by suboptimal performance in a subsequent stage. This point was also raised by results found by Snippe (2008), which will be described below.

Snippe (2008) had participants perform a creative task (generating and selecting slogans and creating a commercial poster for a fictional product) in dyads. Half of the dyads were composed of friends, half of the dyads were composed of strangers. Further, half of the dyads were instructed to work with a unanimity rule (both dyad members had an equal say in deciding which slogans were to be used on the poster), whereas the other dyads were instructed to use a dictatorial rule (one dyad member decided). Participants first generated slogans and wrote them down. In the next stage, participants selected the slogans that they wanted to use on the poster. Finally, participants received materials (colored paper, colored pencils, etc.) to create their poster. All generated and selected slogans were rated for originality and appropriateness, and all posters were rated for creativity.

There were no differences between conditions with regard to the number, originality, or appropriateness of the slogans that the dyads generated in the first stage. However, dyads consisting of friends working under a unanimity rule created posters of lower quality than other dyads in the last stage. Subsequent analyses revealed that this was not due to the creativity of the poster itself (such as the visual attractiveness or the use of available materials), but only to the quality of the slogans that were used on the poster: these dyads selected slogans that were equal in originality, but lower in appropriateness, than those selected by other dyads. In other words, although dyads in the friends/unanimity rule condition generated slogans that were as good as those generated in the other conditions, their suboptimal selection in the second stage put them at a disadvantage when making the final product.

Snippe's (2008) results again illustrate how the message of creativity research may depend on the way creativity is approached. Had the researcher focused only on idea generation, she would have concluded that her manipulation had no effect on creative performance; the opposite conclusion would have been drawn if the researcher had only focused on the creativity of the end product. The results also emphasize the critical importance of the idea selection phase. A suboptimal selection of slogans eventually led to lower creativity rating of the final product (the poster).

To summarize, these four studies show that (1) different stages of the creative process are affected by different variables, and (2) good performance in one stage does not necessarily imply good performance in the next stage. Furthermore, they show the critical importance of the idea selection stage. While innovation researchers have often argued that for innovation idea implementation might be more important than idea generation (e.g., West, 2002), these results show that the intermediate stage of idea selection may be equally critical.

4. IMPLICATIONS FOR THE MANAGEMENT OF GROUPS AND TEAMS

In the previous sections, we have argued that research should take a multifacet–multistage approach to creativity, rather than studying isolated components or stages, or lumping different components or stages together. We have reviewed some empirical evidence to show the importance (both practical and theoretical) of this approach. One issue that has not been addressed explicitly is how this will translate into specific recommendations for the management of creativity in groups and teams.

The obvious recommendation of course is that team managers should be aware of the different demands made by different stages or aspects of creativity. Facilitating a team to generate many ideas (e.g., by removing external demands or concerns about idea quality) will not necessarily lead to optimal idea selection or implementation; facilitating a team to think flexibly will not necessarily lead to higher perseverance; and so on. Thus, if one wants to facilitate creative performance, the first question to ask is *what* exactly it is that needs to be facilitated. Then, assuming that managers want to facilitate all or multiple stages or facets of the creative process, they should be willing and able to *shift* between different conditions or prescriptions. Whereas creative idea generation requires a situation where group members feel safe and free from criticism, idea selection, and creative decision-making benefit from dissent and discussion (e.g., Brodbeck, Kerschreiter, Mojzisch, Frey, & Schulz-Hardt, 2002; De Dreu, 2002; Nemeth, Personnaz, Personnaz, & Goncalo, 2004). Thus, groups may need to be able to adapt their *climate* (Anderson & West, 1996, 1998; Reichers & Schneider, 1990) to changing task demands, or at least need to maintain a climate that takes different task demands into account.

To illustrate this, several studies have shown that creativity of group members may benefit from a climate of independence and nonconformity (Beersma & De Dreu, 2005; Chirumbolo et al., 2004, 2005; Goncalo & Staw, 2006; Nemeth et al., 2004). Goncalo and Staw (2006), for example, had group members describe either why they were similar to other members (activating collectivist values) or why they were unique (activating individualistic values). Next, the groups had to generate ideas. The authors found that those groups in which individualistic values were activated were more creative than those in which collectivistic values were activated. However, transforming ideas into creative group products may require a different climate. Taggar (2002), for example, found that individual-level creativity only transformed to group level creativity (groups had to write reports that were rated on creativity) when groups were characterized by a cooperative climate. Having a cooperative climate might not be the same as having a climate in which independence and nonconformity is emphasized.

In this context, the notion of *climate strength* may be particularly important (Chan, 1998; González-Romá, Peiró, & Tordera, 2002; Schneider, Salvaggio, & Subirats, 2002). Whereas most research on group or team climates has concerned itself with climate level, that is, the mean level of climate perceptions within a team, recent research suggests that an important moderating role may be played by climate strength, that is, the degree to which team members actually perceive the same climate. Specifically, evidence suggests that the effects of climate level may be more pronounced for those teams where climate is strong, rather than weak (González-Romá et al., 2002; Schneider et al., 2002). Schneider et al. (2002) hypothesize that this is the case because a strong climate means that all team members have similar expectations and perceptions of the team, and it therefore becomes easier to align efforts into the same direction. Thus, a positive (with regard to level) and strong climate for innovation (Anderson & West, 1996, 1998) should lead to more innovative behavior than a positive, but weak climate for innovation. Similarly, a team where the climate for innovation is negative and strong, should be less innovative than a team where the climate for innovation is negative and weak.

However, whether climate level and strength will interact in this way, may depend on the specific aspect or stage of the creative and innovative process under study. For example, it is plausible that climate strength is an important moderator during idea generation, but less so during idea selection. When a group's climate is weak, group members do not share the same expectations of which behavior is appropriate, and idea generation may, therefore, suffer because of evaluation apprehension and conformity pressure. During idea selection, however, open discussion and dissent are probably highly important to come to a good decision; in that situation, a weak climate may be highly beneficial (cf. Janis, 1972).

Whether groups will actually be able to shift their climate between different stages is an open question. There is research showing that groups get "entrained" in particular patterns of activity (e.g., Kelly & Karau, 1999; Paulus & Dzindolet, 1993); this could make it difficult for groups to switch their behavior in accordance with the demands of different stages. Thus, it may sometimes be useful to divide creativity or innovation projects sequentially across different workgroups.

5. CONCLUSION

In this chapter, we have argued that creativity research would benefit from an increase in attention to the multiple stages and facets that comprise creativity. We have illustrated this argument with a number of studies on the different stages (specifically, idea generation and idea selection) and facets (fluency, originality, flexibility) of creativity. We have shown that (1) performance in one stage of the creative process does not automatically carry over into the next stages, (2) different stages of the creative process may be affected by completely different variables, (3) different aspects of creative performance can meaningfully differ in their relations with other variables, and (4) a dual-pathway model of creative performance can account for such differences.

Again, we should note that we are not the first authors to stress the importance of a multistage, multifacet approach (e.g., Amabile, 1996; Cummings & O'Connell, 1978; Guilford, 1967; Osborn, 1963; Shalley et al., 2004). On the whole, creativity researchers (and, presumably, practitioners) are quite aware of the complex nature of the creative process. However, it appears that this awareness is not routinely adopted in research designs or in measurements. While the approaches we dubbed over- and under-analytical in the beginning of this chapter clearly lead to important and valuable results, we think that the field of creativity research by now is ready for a more integrative approach of its subject, also in light of the increasing attention for multilevel issues in creativity (e.g., Taggar, 2002; Woodman et al., 1993).

Creativity remains a difficult research topic; not only because of its complexity, but also because laypeople and practitioners usually have strong feelings about the subject. In the context of organizations, this problem is exacerbated by the demand for practical recommendations, preferably recommendations that are not too complex. From that perspective, our main message – that there is no single set of conditions that can be said to be "good for creativity" – may not be very welcome. However, we do believe that our message can easily be translated into one simple and practical recommendation: try to force yourself and others to be as explicit as possible about what the word "creativity" should be taken to mean in any particular context. It may make things a bit confusing initially, but it will certainly clear things up in the long run.

REFERENCES

Amabile, T. M. (1979). Effects of external evaluation on artistic creativity. *Journal of Personality and Social Psychology*, *37*, 221–233.

Amabile, T. M. (1996). *Creativity in context: Update to 'The Social Psychology of Creativity'.* Boulder, CO: Westview Press.

Anderson, N., De Dreu, C. K. W., & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, *25*, 147–173.

Anderson, N., & West, M. A. (1996). The Team Climate Inventory: Development of the TCI and its applications in teambuilding for innovativeness. *European Journal of Work and Organizational Psychology*, *5*, 53–66.

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, *19*, 235–258.

Ashby, F. G., Isen, A. M., & Turken, A. U. (1999). A neuropsychological theory of positive affect and its influence on cognition. *Psychological Review*, *106*, 529–550.

Barrett, L. F., & Russell, J. A. (1998). Independence and bipolarity in the structure of current affect. *Journal of Personality and Social Psychology*, *74*, 967–984.

Barron, F. (1953). Complexity-simplicity as a personality dimension. *The Journal of Abnormal and Social Psychology*, *48*, 163.

Beersma, B., & De Dreu, C. K. W. (2005). Conflict's consequences: Effects of social motives on postnegotiation creative and convergent group functioning and performance. *Journal of Personality and Social Psychology*, *89*, 358–374.

Boden, M. A. (1998). Creativity and artificial intelligence. *Artificial Intelligence*, *103*, 347–356.

Boden, M. A. (2004). *The creative mind: Myths and mechanisms.* London, UK: Routledge.

Brodbeck, F. C., Kerschreiter, R., Mojzisch, A., Frey, D., & Schulz-Hardt, S. (2002). The dissemination of critical, unshared information in decision-making groups: The effects of pre-discussion dissent. *European Journal of Social Psychology*, *32*, 35–56.

Brown, V., Tumeo, M., Larey, T. S., & Paulus, P. B. (1998). Modeling cognitive interactions during group brainstorming. *Small Group Research*, *29*, 495–526.

Bunce, D., & West, M. A. (1995). Self perceptions and perceptions of group climate as predictors of individual innovation at work. *Applied Psychology: An International Review*, *44*, 199–215.

Camacho, L. M., & Paulus, P. B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology*, *68*, 1071–1080.

Carnevale, P. J., & Probst, T. M. (1998). Social values and social conflict in creative problem solving and categorization. *Journal of Personality and Social Psychology*, *74*, 1300–1309.

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, *83*, 234–246.

Chirumbolo, A., Livi, S., Mannetti, L., Pierro, A., & Kruglanski, A. W. (2004). Effects of need for closure on creativity in small group interactions. *European Journal of Personality*, *18*, 265–278.

Chirumbolo, A., Mannetti, L., Pierro, A., Areni, A., & Kruglanski, A. W. (2005). Motivated closed-mindedness and creativity in small groups. *Small Group Research*, *36*, 59–82.

Collaros, P. A., & Anderson, L. R. (1969). Effect of perceived expertness upon creativity of members of brainstorming groups. *Journal of Applied Psychology*, *53*, 159–163.

Collins, M. A., & Amabile, T. M. (1999). Motivation and creativity. In: R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 297–312). New York, NY: Cambridge University Press.

Commission of the European Communities. (2000). *Innovation in a knowledge-driven economy*. Retrieved March 4, 2005 from ftp://ftp.cordis.lu/pub/innovation-policy/communications/communication_2000_en.pdf

Coskun, H., Paulus, P. B., Brown, V., & Sherwood, J. J. (2000). Cognitive stimulation and problem presentation in idea-generating groups. *Group Dynamics: Theory, Research, and Practice*, *4*, 307–329.

Cummings, L. L., & O'Connell, M. J. (1978). Organizational innovation: A model and needed research. *Journal of Business Research*, *6*, 33–50.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: HarperCollins.

De Dreu, C. K. W. (2002). Team innovation and team effectiveness: The importance of minority dissent and reflexivity. *European Journal of Work and Organizational Psychology*, *11*, 285–298.

De Dreu, C. K. W., Baas, M., & Nijstad, B. A. (2008). Hedonic tone and activation level in the mood-creativity link: Towards a dual pathway to creativity model. *Journal of Personality and Social Psychology*, *94*, 739–756.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*, 1191–1201.

Dennis, A. R., Valacich, J. S., Connolly, T., & Wynne, B. E. (1996). Process structuring in electronic brainstorming. *Information Systems Research*, *7*, 268–277.

Diehl, M. (1991). *Kollektive Kreativität: Zur Quantität und Qualität der Ideenproduktion in Kleingruppen* [*Collective creativity: On quantity and quality of idea production in small groups*]. Unpublished Habilitationschrift, University of Tübingen, Germany.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.

Dietrich, A. (2004). The cognitive neuroscience of creativity. *Psychonomic Bulletin & Review*, *11*, 1011–1026.

Duncker, K. (1945). On problem-solving. *Psychological Monographs*, *58*:5 (whole no. 270).

Elsbach, K. D., & Hargadon, A. B. (2006). Enhancing creativity through 'mindless' work: A framework of workday design. *Organization Science*, *17*, 470–483.

Eysenck, H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry*, *4*, 147–178.

Faure, C. (2004). Beyond brainstorming: Effects of different group procedures on selection of ideas and satisfaction with the process. *Journal of Creative Behavior*, *38*, 13–34.

Feist, G. J. (1999). The influence of personality on artistic and scientific creativity. In: R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 273–296). New York, NY: Cambridge University Press.

Feist, G. J. (2006). How development and personality influence scientific thought, interest, and achievement. *Review of General Psychology*, *10*, 163–182.

Finke, R. A. (1996). Imagery, creativity, and emergent structure. *Consciousness & Cognition*, *5*, 381–393.

Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative cognition: Theory, research, and applications*. Cambridge, MA: The MIT Press.

Ford, C., & Sullivan, D. M. (2004). A time for everything: How the timing of novel contributions influences project team outcomes. *Journal of Organizational Behavior*, *25*, 279–292.

Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology*, *87*, 177–189.

Friedman, R. S., & Förster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology*, *81*, 1001–1013.

Gersick, C. J. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal*, *31*, 9–41.

Gersick, C. J. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal*, *32*, 274–309.

Goncalo, J. A., & Staw, B. M. (2006). Individualism-collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*, 96–109.

González-Romá, V., Peiró, J. M., & Tordera, N. (2002). An examination of the antecedents and moderator influences of climate strength. *Journal of Applied Psychology*, *87*, 465–473.

Gray, J. A. (1982). Precis of the neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system. *Behavioral and Brain Sciences*, *5*, 469–534.

Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.

Harrington, D. M. (1975). Effects of explicit instructions to 'be creative' on the psychological meaning of divergent thinking test scores. *Journal of Personality*, *43*, 434–454.

Hennessey, B. A. (2003). Is the social psychology of creativity really social? Moving beyond a focus on the individual. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 181–201). New York, NY: Oxford University Press.

Isen, A. M., & Daubman, K. A. (1984). The influence of affect on categorization. *Journal of Personality and Social Psychology*, *47*, 1206–1217.

Janis, I. L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes*. Oxford, UK: Houghton Mifflin.

Kelly, J. R., & Karau, S. J. (1999). Group decision making: The effects of initial preferences and time pressure. *Personality and Social Psychology Bulletin*, *25*, 1342–1354.

Kruglanski, A. W., & Webster, D. M. (1991). Group members' reactions to opinion deviates and conformists at varying degrees of proximity to decision deadline and of environmental noise. *Journal of Personality and Social Psychology*, *61*, 212–225.

Lamm, H., & Trommsdorff, G. (1973). Group versus individual performance on tasks requiring ideational proficiency (brainstorming): A review. *European Journal of Social Psychology*, *3*, 361–388.

Mahmood, I. P., & Rufin, C. (2005). Government's dilemma: The role of government in imitation and innovation. *Academy of Management Review*, *30*, 338–360.

McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of Personality and Social Psychology*, *52*, 1258–1265.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, *69*, 220–232.

Mikulincer, M., Paz, D., & Kedem, P. (1990). Anxiety and categorization: II. Hierarchical levels of mental categories. *Personality and Individual Differences*, *11*, 815–821.

Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology*, *12*, 3–23.

Mumford, M. D., & Gustafson, S. G. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, *103*, 27–43.

Murray, N., Sujan, H., Hirt, E. R., & Sujan, M. (1990). The influence of mood on categorization: A cognitive flexibility interpretation. *Journal of Personality and Social Psychology*, *59*, 411–425.

Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, *93*, 10–20.

Nemeth, C. J., Personnaz, B., Personnaz, M., & Goncalo, J. A. (2004). The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology*, *34*, 365–374.

Neuberg, S. L., & Newsom, J. (1993). Personal need for structure: Individual differences in the desire for simple structure. *Journal of Personality and Social Psychology*, *65*, 113–131.

Nijstad, B. A., & Levine, J. M. (2007). Group creativity and the stages of creative problem solving. In: M. Hewstone, H. A. W. Schut, J. B. F. de Wit, K. van den Bos & M. S. Stroebe (Eds), *The scope of social psychology: Theory and application* (pp. 159–171). Hove, UK: Psychology Press.

Nijstad, B. A., & Stroebe, W. (2006). How the group affects the mind: A cognitive model of idea generation in groups. *Personality and Social Psychology Review*, *10*, 186–213.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. (2002). Cognitive stimulation and interference in groups: Exposure effects in an idea generation task. *Journal of Experimental Social Psychology*, *38*, 535–544.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. (2003). Production blocking and idea generation: Does blocking interfere with cognitive processes? *Journal of Experimental Social Psychology*, *39*, 531–548.

Osborn, A. F. (1963). *Applied imagination* (3rd ed.). New York: Scribner.

Parnes, S. J. (Ed.) (1992). *Source book for creative problem-solving: A fifty year digest of proven innovation processes*. Buffalo, NY: Creative Education Foundation Press.

Parnes, S. J., & Meadow, A. (1959). Effects of 'brainstorming' instructions on creative problem solving by trained and untrained subjects. *Journal of Educational Psychology*, *50*, 171–176.

Patterson, F. (2002). Great minds don't think alike? Person-level predictors of innovation at work. In: C. L. Cooper & I. T. Robertson (Eds), *International review of industrial and organizational psychology* (Vol. 17, pp. 115–144). New York: Wiley.

Paulus, P. B., & Brown, V. R. (2003). Enhancing ideational creativity in groups: Lessons from research on brainstorming. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 110–136). New York, NY: Oxford University Press.

Paulus, P. B., & Dzindolet, M. T. (1993). Social influence processes in group brainstorming. *Journal of Personality and Social Psychology*, *64*, 575–586.

Paulus, P. B., Dzindolet, M. T., Poletes, G., & Camacho, L. M. (1993). Perception of performance in group brainstorming: The illusion of group productivity. *Personality and Social Psychology Bulletin*, *19*, 78–89.

Paulus, P. B., & Nijstad, B. A. (Eds). (2003). *Group creativity: Innovation through collaboration*. New York, NY: Oxford University Press.

Putman, V. L., & Paulus, P. B. (in press). Brainstorming, brainstorming rules and decision making. *Journal of Creative Behavior*.

Reichers, A., & Schneider, B. (1990). Climate and culture: An evolution of constructs. In: B. Schneider (Ed.), *Organizational climate and culture* (pp. 5–39). San Francisco, CA: Jossey-Bass.

Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan*, *42*, 305–310.

Rietzschel, E. F., De Dreu, C. K. W., & Nijstad, B. A. (2007). Personal need for structure and creative performance: The moderating influence of fear of invalidity. *Personality and Social Psychology Bulletin*, *33*, 855–866.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2006). Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. *Journal of Experimental Social Psychology*, *42*, 244–251.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2007). Relative accessibility of domain knowledge and creativity: The effects of knowledge activation on the quantity and originality of generated ideas. *Journal of Experimental Social Psychology*, *43*, 933–946.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2008). *Problem scope and idea selection*. University of Groningen, unpublished manuscript.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (in press). The selection of creative ideas after individual idea generation: Overcoming the bias against originality. *British Journal of Psychology*.

Rosch, E. (1975). Cognitive representations of semantic categories. *Journal of Experimental Psychology: General*, *104*, 192–233.

Runco, M. A., & Charles, R. E. (1993). Judgments of originality and appropriateness as predictors of creativity. *Personality and Individual Differences*, *15*, 537–546.

Schneider, B., Salvaggio, A. N., & Subirats, M. (2002). Climate strength: A new direction for climate research. *Journal of Applied Psychology*, *87*, 220–229.

Schooler, J. W., Ohlsson, S., & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, *122*, 166–183.

Shalley, C. E. (1991). Effects of productivity goals, creativity goals, and personal discretion on individual creativity. *Journal of Applied Psychology*, *76*, 179–185.

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, *30*, 933–958.

Simonton, D. K. (1997). Creative productivity: A predictive and explanatory model of career trajectories and landmarks. *Psychological Review*, *104*, 66–89.

Simonton, D. K. (1999). *Origins of genius: Darwinian perspectives on creativity*. New York: Oxford University Press.

Smith, S. M., & Blankenship, S. E. (1991). Incubation and the persistence of fixation in problem solving. *The American Journal of Psychology*, *104*, 61–87.

Smith, S. M., Ward, T. B., & Schumacher, J. S. (1993). Constraining effects of examples in a creative generations task. *Memory and Cognition*, *21*, 837–845.

Snippe, A. (2008). *Innovatieve prestaties: De invloed van beslisregels en vriendschap op de effectiviteit en de innovatieve prestaties van tweetallen* [*Innovative performance: Effects of friendship and decision-rules on effectiveness and innovative performance in dyads*]. Unpublished Master's thesis, University of Groningen.

Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In: R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 3–15). New York: Cambridge University Press.

Stroebe, W., & Diehl, M. (1994). Why groups are less effective than their members: On productivity losses in idea-generating groups. In: W. Stroebe & M. Hewstone (Eds), *European review of social psychology* (Vol. 5, pp. 271–303). London, UK: Wiley.

Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, *45*, 315–330.

Thompson, M. M., Naccarato, M. E., Parker, K. C. H., & Moskowitz, G. B. (2001). The personal need for structure and personal fear of invalidity measures: Historical perspectives, current applications, and future directions. In: G. B. Moskowitz (Ed.), *Cognitive social psychology: The Princeton symposium on the legacy and future of social cognition* (pp. 19–39). Mahwah, NJ: Erlbaum.

Torrance, E. P. (1966). *Torrance tests of creative thinking*. Bensenville, IL: Scholastic Testing Service.

Wallas, G. (1926). *The art of thought*. New York: Harcourt Brace.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063–1070.

West, M. A. (1989). Innovation amongst health care professionals. *Social Behaviour*, *4*, 173–184.

West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, *51*, 355–387.

West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *Journal of Applied Psychology*, *81*, 680–693.

West, M. A., Sacramento, C. A., & Fay, D. (2005). Creativity and innovation implementation in work groups: The paradoxical role of demands. In: L. L. Thompson & H. S. Choi (Eds), *Creativity and innovation in organizational teams* (pp. 137–159). Mahwah, NJ: Lawrence Erlbaum.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*, 293–321.

Zhou, J., & Shalley, C. E. (2008). *Handbook of organizational creativity*. New York, NY: Lawrence Erlbaum.

ENHANCING GROUP CREATIVITY: THE SEARCH FOR SYNERGY

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ABSTRACT

Much of the idea exchange and evaluation that are part of the creative process occur in groups. It is often presumed that groups facilitate these processes, but much research indicates that groups often hinder effective exchange of ideas and that they may not facilitate their evaluation. We summarize the factors that limit the potential of groups in these domains and use the cognitive–social–motivational model (Paulus & Brown, 2003, 2007) to highlight the conditions under which group creativity is enhanced. In particular, we focus on the conditions under which groups can actually outperform similar size sets of individuals and thus provide evidence for synergy in creative groups.

Although group creativity is a popular topic today, the first academic books on group creativity were only published a few years ago (Paulus & Nijstad, 2003; Sawyer, 2003). Up to that time the predominant focus of the creativity literature had been on individual creativity (e.g., Ochse, 1990), and many studies had examined the personal, social, motivational, and cognitive factors related to individual creativity. Genius was seen as residing in the individual (Simonton, 1988). However, today there is much reliance on teamwork and an assumption in the popular literature that groups have

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great potential for creativity (Sawyer, 2007). In a similar vein, it is often assumed that teams which involve group interaction can be highly innovative (Kozlowski & Ilgen, 2006). Although there is no doubt that some groups and teams can excel in the production of creative ideas or products, much literature in the area of group dynamics suggests that groups are often much less creative and productive than is often assumed (Paulus & van der Zee, 2004).

GROUP CREATIVITY: ADDITION OR SYNERGY?

Much that is written about creative groups and teams involves cases or examples of highly successful groups (e.g., Sawyer, 2007). While these examples are indeed inspiring, it is not possible to know from such groups how much of the excellence of the group was due to the individual talents of the group members and how much was due to the interaction among the group members. The success of a group or team may simply be the result of the addition of the separate knowledge, abilities, and skills of individual group members. For example, today scientists are encouraged to collaborate with scientists from other disciplines so that they may have an increased likelihood of coming up with breakthroughs that require knowledge in more than one discipline (Dunbar, 1997). Although this makes much pragmatic sense, theoretically it is not surprising that a team of individuals with a variety of skills can outperform an individual whose expertise lies in only one of these areas. A more interesting question is whether an interactive group of individuals with diverse expertise will outperform a set of individuals with a similar range of skills who are not interacting as a group. That is, if we compared a group of four individuals who interacted with each other to come up with novel solutions to a problem with the solutions of four individuals who did not interact with each other (often called a nominal group), would the group yield more and better solutions than the set of individuals? If that indeed is the case, we have obtained real evidence of group creativity. That is, the group interaction had a positive effect on the group members which allowed the group to exceed the benefit of merely adding the contributions of four individual members. This is the "holy grail" or the synergistic effect that many of us in the area of group creativity have sought for many years.

By synergy we mean the added benefit of group collaboration that is the result of cognitive or motivational stimulation that results from the group interaction process (Paulus & Brown, 2007). It is this type of stimulation that may be important to the ever-present search for technological advancements (Thore, 1995). This type of synergy can be distinguished from the benefits of group interaction that derive from simple complementarity of skills (assembly bonus, Tindale & Larson, 1992) or from interdependence in which a task cannot be accomplished without the collaborative efforts of the group members (Saavedra, Earley, & Van Dyne, 1993).

Saavedra et al. (1993) outlined a hierarchy of pooled, sequential, reciprocal and team level interdependence among the individuals in groups that have some relevance to our perspective on synergy. Pooled interdependence refers to summation of individual performances where each member performs the whole task independent of each other. This is equivalent to the nominal brainstorming paradigm where each member completes the task alone and the performance of the group is measured by the pooled output of all the members of the group. Sequential interdependence refers to performing different parts of the task in a sequential order. Each step has to be performed successfully to reach the subsequent step. For example, innovation can be achieved through two distinct steps – ideation and implementation. Implementation can only be done after the phase of idea generation. Reciprocal interdependence is characterized by two-way-interaction. Each member has a specific role in the task and the accomplishment of the task requires coordination among its members. Synergistic effects in a brainstorming task are similar to reciprocal interdependence. In the group ideation process each member generates ideas based on his knowledge and expertise and the quality of the pool of ideas depends on the degree of diversity among the group members (keeping the effects of other types of diversity constant). Finally team interdependence is characterized by group level exchange of ideas, information and resources to decide the particular course of inputs and outputs among its members to accomplish the task. While these cases indeed represent benefits of group interaction, we are primarily concerned with the cognitive and social stimulating potential of group interaction (or ideational synergy).

To determine whether in a particular case ideational synergy has been demonstrated would require some type of comparison with a non-interactive group. In many situations comparisons with such groups or nominal groups are not feasible. Some tasks simply cannot be done by individuals. An individual cannot build an airliner given all of the complexity of this task or play a football game. Some tasks are basically group or team tasks. However, even in that case one can ask, how well does the group or team perform in comparison with other groups? There is an extensive literature in the area of teamwork that involves mostly comparison of different kinds of teams or teams working under different conditions (e.g., different styles of leadership) (Jung, 2001; Kozlowski & Ilgen, 2006). Although this is an important and useful approach, these studies do not allow us to determine how well each group utilizes the individual capabilities of each group member. That is, group members may be more motivated under some types of leaders, but that does not necessarily mean that the group members are effectively combining their knowledge and skill to produce an outcome that would not have been possible without such interaction. Thus, a scientific team in which group members learn from each other and gain deeper understanding of a phenomenon is more likely to lead to breakthroughs than one in which each simply plays their assigned role without trying to enhance their understanding of the perspectives of the other group members.

Much of the research on group creativity has been done in laboratory settings. These settings are ideal for obtaining precise measurement of performance and allowing for the careful control of irrelevant variables. These studies have also often used control groups to provide comparisons for experimental groups. Many of these studies have used brainstorming tasks, since these are an analogue of the group ideation process in most innovation settings. That is, group innovation requires the exchange of ideas, information, and expertise in the production of a creative product. The analysis of the brainstorming process provides insights to the factors that influence this creative process and allows for the assessment of various theoretical models of this process. These insights can then be applied to more complex and realistic innovation settings. Our research and focus has been the brainstorming process for that reason, and we will summarize the major conclusions of research in this area and its implications for the group creative process.

EXPLAINING PRODUCTION LOSSES

To understand how to produce synergy, it is important to understand why groups often perform more poorly than nominal groups. Evidence suggests that there are a number of contributing factors. Even though brainstorming groups typically emphasize the need to defer criticism of ideas till a later evaluation stage, group members may still be apprehensive about the reaction of others to their ideas. Most people want to be seen in a positive light and may avoid sharing half-baked or weird ideas that might actually stimulate the group to develop even better ideas. To the extent that individuals feel their ideas are being evaluated by others or they are dispositionally anxious in groups, they may be less creative in groups than alone (Camacho & Paulus, 1995; Diehl & Stroebe, 1987).

In a group setting, individuals are aware of the activity level of each member in contributing to the group. Some members may be initially more active than other group members. Individuals may use the performance level of others in the group as a basis for determining the appropriate level of performance (social comparison, Paulus & Dzindolet, 1993; Paulus, Dzindolet, Poletes, & Camacho, 1993). As a result, there appears to be a tendency of group members to converge or become more similar over time (Paulus & Dzindolet, 1993; Ziegler, Diehl, & Zijlstra, 2000). If there is not a strong incentive to achieve in the groups, group members may tend to converge toward the performance level of the low performers in the group (downward comparison) (Camacho & Paulus, 1995; Paulus & Dzindolet, 1993). Group members also tend to get fixated to a particular topic leading to a situation of being "stuck in the rut" (Larey & Paulus, 1999; Ziegler et al., 2000), which may hamper the production of diverse ideas.

A major problem with group interaction in face-to-face groups is that only one person can talk at one time. As a result, group members may spend most of their time waiting their turn to speak. While awaiting their turn, they may forget their ideas, may not be able to think of additional ones, or may decide not to share their ideas. Moreover, the dual tasks of paying attention to others' ideas and generating one's own ideas lead to cognitive overload which inhibits the ideation process (Coskun, Paulus, Brown, & Sherwood, 2000). These inhibitory effects of group interaction are called production blocking (Diehl & Stroebe, 1987; Lamm & Trommsdorff, 1973; Nijstad & Stroebe, 2006) and increase as the number of members of the group increases. Therefore, it is not surprising that as the face-to-face groups become larger, the productivity gap between interacting and nominal groups increases (Bouchard, Drauden, & Barsaloux, 1974).

Even though there are factors which inhibit group interaction, it is often important or necessary to collaborate as a group. In such cases, it would be important to find ways to overcome the various inhibitory factors and ways in which group members can optimize the benefits of their interaction. We will outline the theoretical and empirical basis for achieving positive outcomes in creative groups.

THEORETICAL BASIS FOR SYNERGY

Synergy presumes that an effective tapping of various cognitive, social, and motivational resources in groups can enable them to attain creative achievements that exceed those possible for individuals working in isolation.

Although it is clear that a number of factors may constrain the ability of groups to be creative, there are some reasons to expect that groups might be quite creative under some conditions. Several models of group creativity (Nijstad & Stroebe, 2006; Paulus & Brown, 2007) have proposed that the sharing of ideas in a group should produce cognitive stimulation. The ideas from one person should stimulate ideas in the mind of the other and vice versa. The presumption is that shared ideas will allow group members to more fully tap their combined categories of knowledge than the combined performance of solitary brainstormers. A number of studies have demonstrated that exposing individual brainstormers to the ideas of others does indeed have such a stimulating effect (Dugosh, Paulus, Roland, & Yang, 2000; Nijstad, Stroebe, & Lodewijkx, 2002). Dugosh et al. (2000) found that the process loss in electronic brainstorming groups can be reduced by synergy when the groups are given instructions to pay attention on the ideas presented by others.

The potential impact of such stimulation at the individual level may be masked by the various inhibitory factors in face-to-face groups. These inhibitory factors may be less evident when group members are able to share their ideas by means of computers or exchanges of ideas on slips of paper. Studies have in fact demonstrated that under such conditions, interactive groups can exceed the performance of nominal groups (DeRosa, Smith, & Hantula, 2007; Dugosh & Paulus, 2005; Dugosh et al., 2000; Paulus & Yang, 2000).

There are also some motivational factors in groups that might enhance creative synergy (Paulus, Dugosh, Dzindolet, Coskun, & Putman, 2002). For example, in group contexts, there is the potential for competition in that individuals will inevitably compare their performance with one another. These comparison processes may motivate individuals to work harder in order to maintain a high level of performance relative to their coworkers (Paulus, Larey, Putman, Leggett, & Roland, 1996). It is clear from our discussion that synergy in groups is attainable under the right conditions. We have developed a theoretical model that provides a basis for understanding the creative potential of groups and predicting under what conditions synergy is likely to occur.

A COGNITIVE–SOCIAL–MOTIVATIONAL MODEL OF GROUP CREATIVITY

Paulus and Brown (2003) integrated the various factors outlined above in a cognitive motivational model (also see Paulus & Brown, 2007). The group creative process is inevitably a social process since it involves interaction with other people. However, it is also fundamentally a cognitive process since it involves sharing of ideas, concepts, perspectives, etc., with others. These "products" have to be retrieved or tapped from the individuals' cognitive resources (memory), shared with others, and processed by these group members. The potential result will be a broad range of ideas, some of which may be further elaborated, combined, or integrated to become the primary group products.

We will focus our discussion on several major theoretical dimensions – task focus and task processing level. These two dimensions help organize our past research findings and the new directions of our work. This approach has been highlighted in a number of our past papers and is implicit in a recent paper by De Drue et al. (2008). This approach integrates the various cognitive, social, and motivational factors that are important in the group creative processes for ideational tasks (Paulus & Brown, 2007). Essentially, we argue that high levels of group creativity require a high level of attention to the activities of other group members and an effective integration of the ideas and information shared by group members.

ALLOCATION OF ATTENTION

Unless members attend carefully to the shared information and ideas, they are likely to show little impact of the sharing experience. Attending to the shared ideas from others allows for stimulation of additional ideas, expanding of the focus to a wider range of topics or categories of knowledge, and allows for group members to use the shared ideas to develop more elaborated combinations. However, the group creative process is a very demanding of one's attentional resources. One has to attend to the elements of the task (visual, motor, cognitive), tap one's own knowledge base and expertise, and listen carefully to the information and ideas shared by other group members. If the task demands are very high (high complexity, many competing activities, the presence of distractors), this may limit the ability of an individual to effectively tap their own intellectual resources. If individuals spend most of their effort in search of their own relevant knowledge, they may not pay much attention to the contributions of others. When individuals spend most of their time taking in the contributions of others, this does not leave much time for tapping their own store of relevant knowledge. A key issue is how should attention be allocated among these competing demands? This optimal allocation proportion is likely to depend on the type of task and the phase of the task. Early in the process of a new task, the various task procedures and guidelines will require considerable attention. If the task requires an effective search of each individual's task relevant knowledge, the task coordination process should be designed to allow for such a search and retrieval process (Nijstad & Stroebe, 2006; Paulus & Brown, 2007). However, at some point, it will be important to complement one's own knowledge and ideas with that of others. So it will be necessary to process such knowledge or ideas and relate these to one's own knowledge/idea base. For example, research has shown that asking participants to memorize the ideas shared by others can enhance the number of ideas generated in a sharing process (Dugosh et al., 2000). However, memorization is an additional task demand that may detract from both the generation of one's own ideas and the attention to the shared ideas from others. Therefore, it is of interest that we have found the memory instructions to be helpful when one is exposed to the ideas from others in an electronic brainstorming format (ideas generated by others are shown on the computer screen while one is in the process of generating one's own ideas), but not when such a task demand slows down the exchange process (as in the exchange of ideas on slips of paper or in face-to-face verbal brainstorming) (Paulus & Yang, 2000; Porterfield, 2000).

Thus far, research has not effectively examined the allocation process over time. That is, would it be best if one first exposed someone to a set of ideas and then allowed this person to generate additional ideas? Or would it be better to allow a person to effectively tap their relevant knowledge base for ideas and then expose them to additional ideas from others? There are bases for expecting benefits of both of these procedures. This issue will be discussed in more detail a bit later in this paper. The complexity of the task may also be important. For fairly simple ideational tasks with unlimited ideas (e.g., uses for a brick), there may be little benefit of shared ideas. However, for tasks that are relatively difficult and require diverse expertise that is typically held by specific individuals (technical, math, scientific, artistic), sharing may greatly increase the group performance. For example, some have suggested that diversity of group composition is most likely a benefit when individuals work on a complex intellectual task that requires diverse skills (Bowers, Pharmer, & Salas, 2000). Attentional processes should also be affected by the task goals. If the task is construed as a collaborative one in which a consensually produced product is desired or diversity of expertise is necessary, group members may be motivated to carefully attend to the contributions of others. However, if there is an emphasis on individual achievement and uniqueness of contributions relative to others, there may be little attention paid to other group members except to compare one's products or ideas with their own. The dimension of proself versus prosocial value orientation as emphasized by De Dreu, Nijstad, and van Knippenberg (2008) as important for information processing may be relevant to this issue.

The attentional focus should also vary as a function of the characteristics of the group members. We tend to be more interested in individuals who are similar to us (Byrne, 1971) or who belong to groups important to our self-definition (salient in-groups, van Knippenberg, De Drue, & Homan, 2004). For example, it has been found that the ideas shared by those who are presumably similar in some relevant dimension have more stimulating impact than ideas presumably generated by a computer (Dugosh & Paulus, 2005). In groups that are ethnically diverse, individuals generate fewer ideas, possibly because they are less interested in the ideas of ‘‘different others’’ (McLeod, Lobel, & Cox, 1996). We presume that similar findings would be obtained if one were to compare the attention to and stimulating effect of exposure to in- or out-group members. One should be more attentive to the contributions of in-group members than out-group members. However, this may depend on the extent to which one's personal or group identity is salient. Enhanced attention in in-group members may occur primarily when one's group identity is salient (Adarves-Yorno, Postmes, & Haslam, 2006).

Personal characteristics may also play a role in attentional focus. There is a long history of research on self-focus that may be relevant. Some individuals may be more self-focused (self-aware), whereas others may be more focused relating to others (extroverts). The various relevant dimensions such as self-awareness (Wicklund, 1980), extroversion (Putman, 2001), social anxiety (Camacho & Paulus, 1995), need for cognition (Shestowsky, Wegener, & Fabrigar, 1998), and proself and prosocial motivation (De Drue et al., 2008) may discriminate among individuals who differ in their motivation to attend to the ideas shared by others. One would expect those high in self-awareness, introversion, and proself orientation to demonstrate less impact of shared ideation. For example, groups of individuals who are low in social anxiety (and thus more prosocial in orientation) demonstrate more benefit of group interaction than those high in social anxiety (Camacho & Paulus, 1995). Similarly, dyads with high need for cognition were perceived to generate more arguments in support to their views and generate more valid arguments than those who are low in need for cognition (Shestowsky et al., 1998).

PROCESSING OF SHARED IDEAS

Although it is important for group members to attend to the shared ideas for there to be any synergistic potential, a full tapping of the shared ideas and information would require additional processing of this information (memory, reflection, evaluation, combination, and elaboration). That is, will group members carefully process the shared ideas and relate them effectively to one another and their own knowledge base? Moreover, will they do an effective job of evaluating the shared ideas for their quality, uniqueness, and feasibility? Although an initial goal may be to generate a lot of ideas, eventually the group will want to select certain ideas for implementation. The deeper processing of shared ideas has had only limited attention in the literature. We will discuss the factors that we deem important for enhancing the deeper processing of ideas.

Deeper and more effective processing of shared ideas requires cognitive abilities, opportunity, and motivation. Participants must have basic abilities to understand, remember, evaluate, and integrate the shared information. Since there are extensive literatures on these issues in other domains (e.g., Sternberg, 2006), we will focus primarily on factors more specific to group contexts.

Task Structure

The way in which group members share ideas appears to be one of the most critical factors in determining the effectiveness of the sharing process. Conventional ways of sharing ideas verbally in a face-to-face meeting type of setting may be enjoyable and may allow for enhancing the impact of the shared ideas by various nonverbal and paraverbal communication channels (Walther, 2006). However, this approach also has a number of drawbacks. The important one is production blocking in that only one person can effectively have the "stage" at one time. This means that others have to wait their turn. This limits individual expression of ideas and may lead to forgetting of ideas as waits for one's turn. Research suggests the inability to express ideas as they occur, may be a critical factor in the low performance of conventional brainstorming groups (Nijstad & Stroebe, 2006). Means for expressing ideas that allow for a sharing of ideas without these constraints, such as by means of computers or writing, allow for a much more productive group exchange in terms of number of ideas (DeRosa et al., 2007). There is also some evidence that electronic exchange of ideas enhances the quality of the ideas that are generated (DeRosa et al., 2007). However, while electronic brainstorming systems allow one to express ideas whenever they occur, there is no assurance that participants will carefully monitor and process the ideas shared. In fact, we have found that only when group members are motivated to attend to the shared ideas (e.g., by memory instructions) will groups of four electronic brainstormers show a benefit of shared ideas (Dugosh et al., 2000).

One reason that group members may not show much benefit of idea sharing is that they may be overwhelmed with their task. They are faced with the challenge of searching their own memory system for relevant categories of knowledge and specific ideas, listening to or reading the ideas of others, keeping these ideas in memory, and relating shared ideas to their own ideas and other shared ideas. One way to simplify these multiple tasks is to structure the ideation process in various ways. Instructing participants not to elaborate their ideas or tell stories reduces the memory and attention load and can enhance the number of ideas generated (Putman & Paulus, 2009). Dealing with only one subcomponent or knowledge domain at a time can enhance the number of ideas generated possibly because group members can focus their attention on only one aspect of the task at a time (Coskun et al., 2000; Dennis, Valacich, Connolly, & Wynne, 1996). Providing brief breaks during the brainstorming process so that participants can reflect on the ideas already shared can also be beneficial (Coskun et al., 2000).

Task Motivation

Although it is important that group members have pertinent abilities and that the task is structured to facilitate the ideation process, there will be little benefit of group interaction unless the participants are highly motivated to share their ideas and process the ideas of others. There are a number of factors in groups that tend to lower this motivation. When group members do not feel fully accountable for the number or quality of their ideas, they may exert less effort in groups than if they were performing individually (Karau & Williams, 1993). If group members are socially anxious or the group context is highly evaluative, group members may not feel free to fully share their ideas or knowledge (Camacho & Paulus, 1995; Diehl & Stroebe, 1987). This may be one reason why groups that are ethnically diverse may generate fewer ideas than homogeneous groups (Nakui, Paulus, & Van der Zee, 2008). Group members are also prone to share information that they have in common rather than unique information, possibly because such information seems more socially valid (Wittenbaum & Bowman, 2004). This tendency is of course counterproductive if one desires a full sharing of the diverse knowledge in the group.

How can we counteract such tendencies in groups to optimize their creative potential? One obvious way is to compose groups of individuals whose personal dispositions are consistent with creative pursuits. Some of the characteristics that may be relevant are high need for achievement, strong intrinsic motivation, enjoyment of thinking, openness to experience, and a divergent thinking style (e.g., Amabile & Mueller, 2007; Brown & Paulus, 2002). Individuals with these characteristics would seem likely to persist in the various phases of the creative process and to have the kind of thinking styles that are conducive to developing novel perspectives. Although selection processes may take place naturally in areas such as science, entertainment, and marketing, in many situations groups involved in creative activities will have not undergone any special selection process. In these cases, the social context may provide the motivational basis for creativity.

An important part of the social context may be the task demands that are set by those in charge. Many innovative companies have charismatic leaders to clearly delineate the goals of the organization and set appropriate guidelines to support innovation. One that has been emphasized in the organizational literature is psychological safety (Edmondson, 1999; West, 2003). When the participants feel that they can take chances and can fail and do not have to follow the "party line," they are more likely to exhibit the types of behaviors consistent with group innovation. Furthermore, when there are clear incentives for creative activities, these activities can become more prevalent. Competition among individuals or among groups can be one incentive that motivates enhanced production of ideas (Coskun, 2000; Lount & Phillips, 2007; Paulus et al., 1996).

TOWARD DEEPER PROCESSING: ENHANCING QUALITY

Although a number of studies have shown that enhancing task structure and task motivation can increase idea generation, most of the findings have been limited to measures of quantity. It is presumed that the same factors that facilitate and motivate increased idea generation will also enhance the quality or depth of ideation. It is true that increased numbers of ideas are typically associated with more good ideas (Diehl & Stroebe, 1987; Mullen, Johnson, & Salas, 1991). However, the average quality of the ideas generated is typically not related to the quantity of ideas. This suggests that some additional factors have to be considered to understand how to increase the quality or depth of ideas.

We suggest that deeper processing may require a shifting of task focus from a generative one to an integrative one. During the generative phase, the focus may be on producing as many ideas possible without evaluating them. However, deeper processing inevitably involves a degree of evaluation. It involves some sort of selection process among the generated ideas. Some ideas may appear more novel, feasible, or relevant to solving key problems. The group may need to focus on a subset of these ideas to further evaluate them, modify them, and combine them with other ideas or domains of knowledge. Eventually, most task groups or organizations want only a limited set of alternatives for implementation. The same people who are good at generating may not be particularly good at the evaluation or integration phase. The evaluation/integration stage requires skills at analysis and deduction and an ability to make minor modifications for improvement. Simonton's (1988) distinction between intuitive and analytical genius and the Kirton's adaptor/innovator dimension (Kirton, 1976) may be relevant. Intuitive or innovative types are likely to be good at generating new ideas, while adaptors and analytical types may be good at modifying existing knowledge or ideas.

Some social contexts may motivate deeper level processing. For example, a diverse group may expose individuals to novel perspectives and may motivate a more careful analysis of one's existing knowledge structure and its relation to these ideas. This type of innovative potential has been demonstrated in the research on exposure to dissent and creativity (Nemeth & Nemeth-Brown, 2003) and in some studies of diverse group interaction (van Knippenberg & Schippers, 2007). A group in which diverse areas of knowledge relevant to the problem are represented in the group is a much more fertile basis for group creativity than a group composed of individuals with mostly overlapping expertise according to our cognitive model of group creativity (Paulus & Brown, 2007). Although this is a reasonable expectation, the evidence for it is rather limited (Mannix & Neale, 2005; van Knippenberg & Schippers, 2007). To benefit from diversity, it may be important to have a very receptive disposition to individuals with diverse backgrounds and expertise. This may motivate one to listen carefully to those with different perspectives or backgrounds and use these perspectives to enrich one's own thinking about an issue. Consistent with this type of perspective, Nakui et al. (2008) found that a positive attitude toward diversity was related to more positive effects of diversity in brainstorming groups. Groups with relatively positive attitudes toward diversity generated more original ideas in ethnically and linguistically diverse groups than in homogeneous groups. The reverse was true for those with relatively negative attitudes toward diversity.

PHASES OF GROUP INTERACTION

When should groups change from their divergent focus to a convergent or evaluative one? This will certainly depend on the type of task and problem. However, a premature shift would mean that groups will not have effectively tapped their collective knowledge base. Once groups start the evaluative process, there may be little inclination to go back to a divergent phase. Groups appear to have a drive to consensus as reflected in research on groupthink (Janis, 1982) and decision making (Stasser, Kerr, & Davis, 1989). Groups may begin the focus on consensus about half-way through the time they have been allotted for their task (Gersick, 1989). However, once groups have begun the consensus phase, it may be difficult to reverse. For example, it has been found that once groups in jury decision making reach a majority in one direction, they almost never reverse their direction (Stasser, Kerr, & Bray, 1982). Even though it may be natural and useful for a group to move from divergence to convergence, it may be important for groups to maintain the flexibility to reverse this process. Decisions or preferred alternatives may need to change as reality changes. Such flexibility may be particularly difficult for groups with a high need for closure (Chirumbolo et al., 2005). The failure to maintain creative and decisional flexibility may be one reason that entrepreneurial organizations find it difficult to stay innovative.

How can groups be motivated or structured to maintain the right balance of convergence and divergence at different phases of the innovation process? As outlined above, we believe that in most cases, they are not able to do so because of the natural shift from divergence to convergence. However, with some degree of turnover in group membership, divergence may be stimulated at the appropriate times (Choi & Thompson, 2005; Nemeth & Ormiston, 2007). Our perspective suggests that such turnover would be most useful in the later stages of the innovative process to be sure that fresh perspectives are maintained. Leaders or facilitators who are attuned to the needs for divergence and convergence in different phases can also lead the group to take the approaches necessary. For example, Coskun (2005) found that a divergent thinking exercise followed by a convergent thinking exercise enhanced the generation of ideas and number of categories surveyed.

We will present brief summaries studies that address some of the issues raised in this chapter. Several of our studies have examined how certain added rules and task decomposition can increase the effectiveness of the idea sharing process. More effective sharing should enable not only generation of more ideas but also a deeper processing of these ideas. Several studies have also examined whether the sequence of alone and group brainstorming affects the idea generation process. Some studies have investigated whether the use of facilitators or training can lead to more effective brainstorming. We have also examined the transition from the brainstorming process (divergence) to the selection process (convergence).

TOWARD MORE EFFECTIVE PROCESSING OF SHARED INFORMATION

Rules

We have noted that group brainstormers may get overloaded with shared information and may not be able to effectively process this information. One problem with sharing ideas in groups is that such sharing tends to be cognitively inefficient. Group members often got off task by discussing issues only tangentially related to the task or spent much time in detailed elaboration of ideas rather than generating new ideas. We have examined the benefit of adding some additional rules or guidelines to counter this tendency. In several studies, we added the instruction not to tell stories or explain ideas as they are being shared. The addition of these instructions enhanced the number of ideas generated similarly for both interactive and nominal groups (Paulus, Nakui, Putman, & Brown, 2006). In particular, it appears that brainstorming with the added rules leads to more efficient or less "wordy" brainstorming (Putman & Paulus, 2009), which in turn allows more time for sharing ideas and processing them.

Task Decomposition

When brainstormers are confronted with a broad ranging brainstorming problem, the task may be somewhat overwhelming, since there are many different aspects to this problem. For example, when students are asked to generate ideas to improve their university, there are at least 20 categories of ideas that they may consider. Research suggests that when individuals are confronted with many alternatives, they tend to avoid making decisions (Chua & Iyengar, 2008). If a similar mechanism is involved in the idea generation process, providing groups with a more specific task focus may facilitate idea generation. For example, several studies have examined whether presenting one aspect of a problem in sequence rather than presenting the issues all at once would enhance brainstorming.

Coskun et al. (2000) investigated the effects of simultaneous and sequential problem presentation paradigm for interactive and nominal groups. In a simultaneous presentation condition, the participant was presented with 10 categories and asked to brainstorm on those categories. In the sequential condition, participants were also presented with these 10 categories but were instructed to begin generating ideas on a new category every three minutes. The sequential condition yielded significantly higher number of ideas than the simultaneous condition for the interactive groups. They found that presenting the groups with a problem decomposed into categories led to improved performance (increase in 60% more ideas) compared to groups where problem was presented as a whole. Similar effects were found in the electronic brainstorming paradigm (Dennis et al., 1996). The production gain was attributed to reduction of cognitive overload during the brainstorming session.

Organizations often require the division of responsibility or assignment of different parts of the task to different members of the group to reduce the cognitive or the physical burden of the responsibilities. Division of the task by assigning roles strengthens positive interdependence in cooperative learning groups, which leads to high group performance (Johnson & Johnson, 1989, 1999). According to Johnson and Johnson (1989), when groups have complementary roles and responsibilities that are interconnected, it contributes to the accomplishment of the task. For example, Harkins and Petty (1982) found that if everyone worked on the same task, participants loafed but when each subject had his or her own unique task, the subjects did not loaf even though each member knew that he/she was unidentifiable in the task. In a similar vein, studies have found that assigned expertise increased the proportion of unshared information mentioned during a collective recall task (Stewart & Stasser, 1995). Stewart and Stasser (1995) found that adequate collective sampling of unshared information depends on coordinated information processing based on members' recognizing each other's responsibility for specific areas of information.

A recent study done in our laboratory (Baruah, 2008) explored how distribution of responsibility for different parts of a task affects the group idea generation process. Although group members were instructed to generate ideas about all aspects of the problem, in some groups each member was assigned primary responsibility for a specific category and in other groups the members were jointly assigned with a set of common categories. If a focus on a specific category enhances motivation and enables deeper information processing, it should yield a higher quantity, flexibility, and originality of the ideas. However, if joint focus on a subset of categories enhances attention to the task and allows for more effective collaborative exchange of ideas, joint assignment should lead to a better performance on these measures.

Participants in groups were assigned categories related to a broader problem (how to improve their university). The participants were specifically instructed to pay attention to the ideas generated by others, since they would be asked to recall the ideas generated by others. The participants brainstormed in groups of three. The results revealed that the groups jointly assigned with three categories generated higher quantity of ideas, explored more topics, and exhibited higher clustering (within category fluency) than the groups who were assigned with individual categories. The instruction of joint task focus may have led these groups to pay attention to all the assigned categories and build on each other's ideas which in turn may have facilitated activation of other categories in the ideation process. Maybe in case of individual category assignment, the members paid too much attention to their assigned part, which may have hampered the synergistic effects.

Sequence

Another way of enhancing the processing of shared ideas in groups is to break the brainstorming process into both individual and group sessions. We have noted that during group idea exchange, it may be difficult to fully process the many ideas that are being shared. Providing a period after group brainstorming for private reflection on the shared ideas and for building on these ideas might be beneficial. It would be best to do this immediately after the brainstorming session to avoid the inevitable forgetting of the shared information over time. Consistent with this line of reasoning, we have found that the group-to-alone sequence can lead to higher quantity of ideas compared to the alone-to-group sequence (Leggett, Putman, Roland, & Paulus, 1996; Paulus and Yang, 2000). Apparently new ideas and associations created during the group interaction could incubate and lead to additional ideas in the subsequent solitary session (Dunnett, Campbell, & Jastaad, 1963; Nagasundaram & Dennis, 1993). However, there may also be some benefit in doing individual brainstorming prior to group brainstorming. The high rate of ideation in the nominal paradigm could be carried over to the subsequent interactive paradigm (Kelly & Karau, 1993; Kelly & McGrath, 1985). This type of effect was termed "entrainment" by Kelly and her colleagues and was found in a study by Baruah and Paulus (2008) which varied whether groups generated ideas in an alone-to-group sequence or a group-to-alone sequence. The alone-to-group sequence led to generation of more ideas overall. Possibly, the best procedure would be one that started with individual brainstorming to generate a large pool of ideas, switched to group brainstorming to provide additional stimulation, and then ended with a private reflection session to build on the shared ideas. Thus far, no study has fully examined the potential benefit of such a procedure.

Facilitators and Training

Production losses in group performance can be eliminated through the use of trained facilitators. A facilitator is not a part of the group but instead is an outsider who helps the groups to interact in a more efficient manner. The facilitator can serve to motivate the group members or to suggest more effective ways of interacting that would minimize some of the negative effects of group interaction and enhance the cognitive benefits. Several researchers have found that the use of facilitators can inspire group members to accept responsibility, build trust, develop a positive participatory climate, and manage diversity (cf. Schuman, 2005). Others have used facilitators to increase the cognitive efficiency of the interaction process. For example, Oxley, Dzindolet, and Paulus (1996) trained a group of facilitators to encourage participants to use Osborn's rules, stay focused on the task, avoid irrelevant thought processes or discussions, and give everyone a chance to contribute. Compared to groups with untrained facilitators, groups with trained facilitators performed well as nominal groups in a 20-minute session. Moreover, nominal and untrained groups showed a typical decline in performance during the brainstorming session, whereas the trained group did not. Several other studies have found similar benefits of facilitators for enhancing brainstorming in groups (e.g., Offner, Kramer, & Winter, 1996). Kramer, Fleming, and Mannis (2001) found that face-to-face groups generated as many ideas as nominal groups by the use of trained facilitators.

Another possible approach to enhance the existing level of creativity is through structured group training, but very few studies have explored this possibility. The most common scenario of a structured training in the organizations is to train the employees in large groups. However, the organizations often have to decompose tasks into parts and delegate responsibilities to small groups. Such small groups need specific training or instructions to focus on their assigned task. Therefore, it is important to train these small groups based on the task to be performed.

A recent study by Baruah and Paulus (2008) investigated the effects of training group brainstormers to generate more and better ideas. They developed a comprehensive training program that incorporates tips and instructions on enhancing attention, accountability, and uniqueness of the ideas generated. The trained group members were instructed to pay attention to each other's ideas and link each other's ideas to come up with more unique ideas. All the group members (irrespective of training or no training condition) were instructed to pay attention on how diverse their group was in terms of gender, ethnicity, and major languages spoken. However, the trained groups were given special instructions to make use of their diversity in the ideation process.

Participants were randomly assigned to one of the four conditions: training followed by a group-to-alone sequence of brainstorming, no training followed by a group-to-alone sequence, training followed by an alone-to-group sequence, and no training followed by an alone-to-group sequence. The results revealed that training had a significantly positive effect on the total number of ideas generated, number of good ideas generated, and the originality of ideas generated. Furthermore, the participants in the alone-to-group sequence benefitted most from the training, possibly because this training enhanced the entrainment effect mentioned earlier. Thus, training the groups to pay attention to each other's ideas and to link ideas can enhance both the quantity and quality of ideas in group brainstorming. The positive effect on quality suggests that training indeed enhanced the processing of ideas.

TURNING IDEAS INTO INNOVATIONS

Although we have suggested a broad range of techniques for enhancing the number and potentially the quality of ideas generated, most organizations can implement only a limited number of innovations or may be looking for one creative solution to a problem. So an important part of the innovation process is selection of the best ideas for possible implementation. A number of studies have examined the process of selecting ideas from the pool of ideas that are generated by brainstorming. One expectation would be that if nominal groups generate more ideas than interactive groups, this larger pool of ideas would facilitate the selection of better ideas. In general, the more ideas generated, the more good ideas occur. A study by Putman and Paulus (2009) found that this was actually the case. Nominal and interactive groups of size three brainstormed in one session and then evaluated the ideas generated as a group in a subsequent session, selecting the best five ideas. The nominals outperformed the interactive groups as usual in terms of number of ideas and also generated ideas of higher originality. In the evaluation session, the group that had brainstormed as nominals selected ideas in their top five ideas that were higher in average originality than those that had brainstormed as interactive groups. This outcome reflects the fact that those who brainstormed as nominal groups had large pool of original ideas. Thus, the advantage of nominal brainstorming persists in subsequent group evaluation session. However, a study in which nominal brainstormers evaluated their ideas alone and group brainstormers as a group did not yield an advantage for nominal brainstormers in the selection of more original ideas (Rietzschel, Nijstad, & Stroebe, 2006). Possibly, having the same evaluation process in the second session (either done as a group or as an individual) for all conditions allows for more precise assessment of the differential impact of prior idea generation on subsequent selection processes. Also, some research suggests that group evaluation of brainstorming ideas may be generally more effective than individual evaluation (Larey & Paulus, 1999). Thus, the individual evaluation sessions after nominal brainstorming in the Rietzschel et al. (2006) study may limit their ability to select the best ideas from the nominal brainstorming session. Furthermore, it appears that groups that evaluate their own ideas in contrast to those who evaluate the ideas generated by others may be more effective in selecting the best ideas (Faure, 2004).

Another issue of interest is whether the generation and evaluation sessions should be clearly separated as unique tasks, as suggested by Osborn (1957), or whether these should be allowed to mesh with one another. Rickards (1975) reported that separation of ideation from the evaluation phase enhanced performance in real managerial situations. A premature initiation of an evaluation process may inhibit the generation of a large number of ideas. Rietzschel et al. (2006) evaluated this possibility by having a one-task condition in which the participants received the instruction of idea generation and selection simultaneously and a two-task condition in which there was a strict separation of idea generation and idea selection. They found that interactive groups assigned to the two-task condition generated more ideas per minute than those under the one-task condition. They speculated that task separation decreases the production blocking and evaluation apprehension in groups. However, their study did not report information regarding the amount of time spent by groups in each of the tasks in the one-task condition.

Even though research has identified conditions related to more effective evaluation of brainstormed ideas, the general ability of groups or individuals to select the best ideas appears to be quite limited. Both Putman and Paulus (2009) and Rietzschel et al. (2006) found that the average originality of the selected ideas in the evaluation phase was not greater than the average quality of the ideas generated in the brainstorming phase. Putman and Paulus (2009) found that groups tended to select ideas that were relatively common in the overall pool of generated ideas. Groups seem to use "commonness" more than novelty in selecting the best ideas. It might be easier for groups to gain consensus on those ideas being the best ones.

Future research will have to further examine the conditions which facilitate the selection of the best ideas. One challenge for this research will be to determine what the criteria for best ideas should be. In the business world, the best ideas are those which lead to successful products or innovations. In the scientific world, they are those that lead to the most interesting and compelling research findings and theories. In society, it is those that lead to the most effective solutions of significant problems. An important challenge for research in this area is to better understand the links between creative processes in real-world groups and the subsequent selection and implementation of ideas. Some have argued that there is little connection between the idea generation process and the actual innovation process (implementation of initiatives) given the many factors that influence the innovation process (West, 2003). Such a perspective would suggest that having highly creative groups in organizations that generate ideas is not related to success of such organizations. We agree that just having creative groups is not sufficient. However, as Putman and Paulus (2009) have found, creative individuals and groups provide very useful input into the innovation selection process. Future studies will have to examine ways to make this link most effective.

SUMMARY AND BROADER IMPLICATIONS

We have highlighted a number of ways in which the cognitive processes related to group creativity can be enhanced. It will remain to be seen how useful these are in everyday organizational brainstorming. It is clear that if one wants to optimize the full group intellectual potential, some use of electronic or written exchange of ideas is important. Only under those conditions have we been able to find that interactive groups can outperform nominal groups. Given that today most interactions involve a mixture of these modalities, it would be useful in future studies to examine the ideal mix of these modalities. It is clear from research using group decision-support systems that electronic brainstorming systems can be useful for generating ideas and voting on them, but that groups often find it difficult to make decisions using such systems (Huang & Li, 2007). So even though a mixture of electronic and face-to-face sessions may be useful for generating ideas (Rickards, 2008), face-to-face sessions may be required for the final decision-making phase. Brainstorming may also benefit from mixing alone and group sessions during brainstorming. The ideal scenario might involve an initial private ideation session, and then a group session to share these and other ideas, and then another private session to build on the ideas shared in the group session. It might be most beneficial if these sessions occurred right after one another to take advantage of the cognitive activation produced in each phase. A long delay in between session and competing activities during these delays could lead to forgetting of ideas or loss of "spreading activation" generated in a brainstorming session. Thus, there may be a significant loss of intellectual momentum if multiple sessions are significantly separated. It would also be of interest to study asynchronous situations in which the brainstorming takes place over a period of time with individuals reading and making contributions at different times.

Another important issue is how long the sessions should be. We have generally relatively short sessions ranging from 10 to 30 minute. In some studies, we have had students brainstorm for an about an hour on the same problem or for an hour and a half on different problems. The various effects we have obtained do not seem to depend on the length of these sessions. Our impression is that the benefits of individual brainstorming are most evident in shorter sessions. In relatively long sessions, individual brainstormers may run out of ideas before group brainstormers do. Moreover, group brainstormers may stimulate each other both cognitively and motivationally to persist longer in the brainstorming process. In fact, Nijstad, Stroebe, and Lodewijkx (1999) have found that such persistence in groups enables them to catch up to the productivity level of nominal groups. So it will be important to study more realistic groups in long-term settings to determine whether such groups indeed can overcome the initial productivity loss problems by persisting in the brainstorming process.

Although we have focused on the performance of groups, we recognize that group interaction may have benefits beyond the products they create. The skills individuals learn in groups, group cohesion and motivation, and the development of transactive memory systems are just a couple of the benefits of group interaction (e.g., Sutton & Hargadon, 1996). These factors will have to be weighed on decisions about how to allocate creative efforts to various types of modalities (alone, group, electronic). However, to the extent that organizations want to optimize the number of quality of creative ideas generated on a particular issue, their decisions should focus largely on how to optimize performance. That will be particularly true in cases where there is a relatively short time frame for coming up with a solution or where the group members are brought together from different parts of the organization to focus on a specific issue. Whatever strategy organizations take in regard to how to tap the creative potential of their employees, they should understand the processes that can enhance and hinder creativity in their groups. If innovation is indeed going to be the key to future success of American business, business cannot afford to base their innovative procedures on procedures that do not have strong evidence for their effectiveness.

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REFERENCES

Adarves-Yorno, I., Postmes, T., & Haslam, S. A. (2006). Social identity and the recognition of creativity in groups. *British Journal of Social Psychology*, *45*(3), 479–497.

Amabile, T. M., & Mueller, J. S. (2007). Assessing creativity and its antecedents: An exploration of the componential theory of creativity. In: J. Zhou & C. E. Shalley (Eds), *The handbook of organizational creativity* (pp. 31–62). Boca Raton, FL: Taylor & Francis Group.

Baruah, J. (2008). *Category assignment and relevance in the group ideation process*. Unpublished Doctoral Dissertation. University of Texas at Arlington.

Baruah, J., & Paulus, P. B. (2008). Effects of training on idea-generation in groups. *Small Group Research*, *39*, 523–541.

Bouchard, T. J., Drauden, G., & Barsaloux, J. (1974). A comparison of individual, subgroup, and total group methods of problem solving. *Journal of Applied Psychology*, *59*, 226–227.

Bowers, C., Pharmer, J. A., & Salas, E. (2000). When member homogeneity is needed in work teams: A meta-analysis. *Small Group Research*, *31*, 305–327.

Brown, V. R., & Paulus, P. B. (2002). Making group brainstorming more effective: Recommendations from an associative memory perspective. *Current Directions in Psychological Science*, *11*, 208–212.

Byrne, D. (1971). The ubiquitous relationship: Attitude similarity and attraction: A cross-cultural study. *Human Relations*, *24*, 201–207.

Camacho, L. M., & Paulus, P. B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology*, *68*, 1071–1080.

Chirumbolo, A., Livi, S., Mannetti, L., Pierro, A., Areni, A., & Kruglanski, A. W. (2005). Motivated closed-mindedness and creativity in small groups. *Small Group Research*, *36*, 59–82.

Choi, H-S., & Thompson, L. (2005). Old wine in a new bottle: Impact of membership change on group creativity. *Organizational Behavior and Decision Processes*, *98*, 121–132.

Chua, R. Y-J., & Iyengar, S. S. (2008). Creativity as a matter of choice: Prior experience and task instruction as boundary conditions for the positive effect of choice on creativity. *Journal of Creative Behavior*, *42*(3), 164–180.

Coskun, H. (2000). *The effects of outgroup comparison, social context, intrinsic motivation, and collective identity in brainstorming groups*. Unpublished doctoral dissertation. The University of Texas at Arlington.

Coskun, H. (2005). Cognitive stimulation with convergent and divergent thinking exercises in brainwriting: Incubation, sequence priming and group context. *Small Group Research*, *36*, 466–498.

Coskun, H., Paulus, P. B., Brown, V., & Sherwood, J. J. (2000). Cognitive stimulation and problem presentation in idea-generating groups. *Group Dynamics: Theory, Research, and Practice*, *4*, 307–329.

De Dreu, C. K. W., Nijstad, B. A., & van Knippenberg, D. (2008). Motivated information processing in group judgment and decision making. *Personality and Social Psychology Review*, *12*, 22–49.

Dennis, A. R., Valacich, J. S., Connolly, T., & Wynne, B. E. (1996). Process structuring in electronic brainstorming. *Information Systems Research*, *7*, 268–277.

DeRosa, D. M., Smith, C. L., & Hantula, D. A. (2007). The medium matters: Mining the long-promised merit of group interaction in creative idea generation tasks in a meta-analysis of the electronic group brainstorming literature. *Computers in Human Behavior*, *23*, 1549–1581.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Towards the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.

Dugosh, K. L., & Paulus, P. B. (2005). Cognitive stimulation and social comparison processes in brainstorming. *Journal of Experimental Social Psychology*, *41*, 313–320.

Dugosh, K. L., Paulus, P. B., Roland, E. J., & Yang, H. (2000). Cognitive stimulation in brainstorming. *Journal of Personality and Social Psychology*, *79*, 722–735.

Dunbar, K. (1997). How scientists think: On-line creativity and conceptual change in science. In: T. B. Ward, S. M. Smith & J. Vaid (Eds), *Creative thought: An investigation of conceptual structures and processes* (pp. 461–493). Washington, DC: American Psychological Association.

Dunnett, M. D., Campbell, J., & Jastaad, K. (1963). The effect of group participation on brainstorming effectiveness for two industrial samples. *Journal of Applied Psychology*, *47*, 30–37.

Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*, 350–383.

Faure, C. (2004). Beyond brainstorming: Effects of different group procedures on selection of ideas and satisfaction with the process. *Journal of Creative Behavior*, *38*, 13–34.

Gersick, C. J. G. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal*, *32*, 274–309.

Harkins, S. G., & Petty, R. E. (1982). Effects of task difficulty and task uniqueness on social loafing. *Journal of Personality and Social Psychology*, *43*, 1214–1229.

Huang, W., & Li, D. (2007). Opening the black box of GSS research: Explaining group decision outcome with group process. *Computers in Human Behavior*, *23*, 58–78.

Janis, I. (1982). *Groupthink* (2nd ed.). Boston, MA: Houghton-Mifflin.

Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Edina, MN: Publisher.

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory Into Practice*, *38*, 67–74.

Jung, D. I. (2001). Transformational and transactional leadership and their effects on creativity in groups. *Creativity Research Journal*, *13*, 185–195.

Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, *65*, 681–706.

Kelly, J. R., & Karau, S. J. (1993). Entrainment of creativity in small groups. *Small Group Research*, *24*, 179–198.

Kelly, J. R., & McGrath, J. E. (1985). Effects of time limits and task types on task performance and interaction of four-person groups. *Journal of Personality and Social Psychology*, *49*, 395–407.

Kirton, M. (1976). Adaptors and innovators: A description and measure. *Journal of Applied Psychology*, *61*, 622–629.

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, *7*, 77–124.

Kramer, M. W., Fleming, G. P., & Mannis, S. M. (2001). Improving face-to-face brainstorming through modeling and facilitation. *Small Group Research*, *32*, 533–557.

Lamm, H., & Trommsdorff, G. (1973). Group versus individual performance on a task requiring ideational proficiency (brainstorming): A review. *European Journal of Social Psychology*, *3*, 362–388.

Larey, T. S., & Paulus, P. B. (1999). Group preference and convergent tendencies in small groups: A content analysis of group brainstorming performance. *Creativity Research Journal*, *12*, 175–184.

Leggett, K. L., Putman, V. L., Roland, E. J., & Paulus, P. B. (1996). The effects of training on performance in group brainstorming. Paper presented at the annual meeting of the Southwestern Psychological Association, Houston, TX.

Lount, R., Jr., & Phillips, K. W. (2007). Working harder with the out-group: The impact of social category diversity on motivation gains. *Organizational Behavior and Human Decision Processes*, *103*, 214–224.

Mannix, E., & Neale, M. A. (2005). What differences make a difference? The promise and reality of diverse teams in organizations. *Psychological Science in the Public Interest*, *6*, 31–55.

McLeod, P. L., Lobel, S. A., & Cox, T. H. (1996). Ethnic diversity & creativity in small groups. *Small Group Research*, *27*, 248–264.

Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology*, *12*, 3–24.

Nagasundaram, M., & Dennis, A. R. (1993). When a group is not a group: The cognitive foundation of group idea generation. *Small Group Research*, *24*, 463–489.

Nakui, T., Paulus, P. B., & Van der Zee (2008). *Effects of diversity and attitude toward diverse groups on perception and performance*. Unpublished manuscript. University of Texas, Arlington.

Nemeth, C. J., & Nemeth-Brown, B. (2003). Better than individuals? The potential benefits of dissent and diversity for group creativity. In: P. B. Paulus & B. A Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 63–84). New York, NY: Oxford University Press.

Nemeth, C. J., & Ormiston, M. (2007). Creative idea generation: Harmony versus stimulation. *European Journal of Social Psychology*, *37*, 524–535.

Nijstad, B., & Stroebe, W. (2006). How the group affects the mind: A cognitive model of idea generation in groups. *Personality and Social Psychology Review*, *10*, 186–213.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. (1999). Persistence of brainstorming groups: How do people know when to stop? *Journal of Experimental Social Psychology*, *35*, 165–185.

Nijstad, B. A., Stroebe, W., & Lodewijkx, F. M. (2002). Cognitive stimulation and interference in groups: Exposure effects in an idea generation task. *Journal of Experimental Social Psychology*, *38*, 534–544.

Ochse, R. (1990). *Before the gates of excellence: The determinants of creative genius*. New York: Cambridge University Press.

Offner, A. K., Kramer, T. J., & Winter, J. P. (1996). The effects of facilitation, recording and pauses on group brainstorming. *Small Group Research*, *27*, 283–298.

Osborn, A. F. (1957). *Applied imagination* (1st ed.). New York: Scribner.

Oxley, N. L., Dzindolet, M. T., & Paulus, P. B. (1996). The effects of facilitators on the performance of brainstorming groups. *Journal of Social Behavior and Personality*, *11*, 633–646.

Paulus, P. B., & Brown, V. R. (2003). Enhancing ideational creativity in groups: Lessons from research on brainstorming. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 110–136). New York, NY: Oxford University Press.

Paulus, P. B., & Brown, V. R. (2007). Toward more creative and innovative group idea generation: A cognitive-social motivational perspective of brainstorming. *Social and Personality Compass*, *1*(1), 248–265.

Paulus, P. B., Dugosh, K. L., Dzindolet, M. T., Coskun, H., & Putman, V. L. (2002). Social and cognitive influences in group brainstorming: Predicting production gains and losses. *European Social Psychology Review*, *12*, 299–325.

Paulus, P. B., & Dzindolet, M. T. (1993). Social influence processes in group brainstorming. *Journal of Personality and Social Psychology*, *64*, 575–586.

Paulus, P. B., Dzindolet, M. T., Poletes, G., & Camacho, L. M. (1993). Perception of performance in group brainstorming: The illusion of group productivity. *Personality and Social Psychology Bulletin*, *19*, 78–89.

Paulus, P. B., Larey, T. S., Putman, V. L., Leggett, K. L., & Roland, E. J. (1996). Social influence processes in computer brainstorming. *Basic and Applied Social Psychology*, *18*, 3–14.

Paulus, P. B., Nakui, T., Putman, V. L., & Brown, V. R. (2006). Effects of task instructions and brief breaks on brainstorming. *Group Dynamics: Theory, Research and Practice*, *10*, 206–219.

Paulus, P. B., & Nijstad, B. (Eds). (2003). *Group creativity: Innovation through collaboration*. New York: Oxford University Press.

Paulus, P. B., & van der Zee, K. I. (2004). Should there be a romance between teams and groups. *Journal of Occupational and Organizational Psychology*, *77*, 475–480.

Paulus, P. B., & Yang, H. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes*, *82*, 76–87.

Porterfield, R. (2000). *The effects of incubation and attention on brainstorming productivity*. Unpublished masters thesis, University of Texas at Arlington.

Putman, V. (2001). *Effects of additional rules and dominance on brainstorming and decision-making*. Unpublished doctoral dissertation. University of Texas at Arlington.

Putman, V. L., & Paulus, P. B. (2009). Brainstorming, brainstorming rules and decision making. *Journal of Creative Behavior*, *43*, 23–39.

Rickards, T. (1975). Brainstorming: An examination of idea production rate and level of speculation in real managerial situations. *R&D Management*, *6*, 11–14.

Rickards, T. (2008). Electronic brainstorming: Asking the right question. *Creativity and Innovation Management*, *31*, 110–114.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2006). Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. *Journal of Experimental Social Psychology*, *42*, 244–251.

Sawyer, K. (2007). *Group genius: The power of creative collaboration*. New York: Basic Books.

Sawyer, R. K. (2003). *Group creativity: Music, theatre, collaboration*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Saavedra, R., Earley, P. C., & Van Dyne, L. (1993). Complex interdependence in task-performing groups. *Journal of Applied Psychology*, *78*, 61–72.

Schuman, S. P. (2005). *The IAF group facilitation handbook*. San Francisco: Jossey-Bass.

Shestowsky, D., Wegener, D. T., & Fabrigar, L. R. (1998). Need for cognition and interpersonal influence: Individual differences in impact on dyadic decisions. *Journal of Personality and Social Psychology*, *74*, 1317–1328.

Simonton, D. K. (1988). *Scientific genius: A psychology of science*. New York: Cambridge University Press.

Stasser, G., Kerr, N. L., & Bray, R. M. (1982). The social psychology of jury deliberation: Structure, process, and product. In: N. L. Kerr & R. M. Bray (Eds), *The psychology of the courtroom*. Orlando, FL: Academic Press.

Stasser, G., Kerr, N. L., & Davis, J. H. (1989). Influence processes and consensus models in decision-making groups. In: P. B. Paulus (Ed.), *Psychology of group influence* (pp. 279–326). Hillsdale, NJ: Erlbaum.

Sternberg, R. J. (2006). Creating a vision of creativity: The first 25 years. *Psychology of Aesthetics, Creativity, and the Arts*, *S*, 2–12.

Stewart, D. D., & Stasser, G. (1995). Expert role assignment and information sampling during collective recall and decision making. *Journal of Personality and Social Psychology*, *69*, 619–628.

Sutton, R. I., & Hargadon, A. (1996). Brainstorming groups in context. *Administrative Science Quarterly*, *41*, 685–718.

Thore, S. (1995). The Diversity, Complexity and Evolution of High Tech Capitalism, Klewer, academic publishers, Boston. Also published on the internet see www.ic2.org

Tindale, R. S., & Larson, J. R. (1992). Assembly bonus effect or typical group performance? A comment on Michaelsen, Watson, and Black (1989). *Journal of Applied Psychology*, *77*, 102–105.

van Knippenberg, D., De Drue, C. K. W., & Homan, A. C. (2004). Work group diversity and group performance: An integrative model and research agenda. *Journal of Applied Psychology*, *89*, 1008–1022.

van Knippenberg, D., & Schippers, M. C. (2007). Work group diversity. *Annual Review of Psychology*, *58*, 515–541.

Walther, J. B. (2006). Nonverbal dynamics in computer-mediated communication, or: (and the Net: ('s with You, :) alone. In: V. Manusov & M. L. Patterson (Eds), *The Sage handbook of nonverbal communication* (pp. 461–479). Thousand Oaks, CA: Sage.

West, M. A. (2003). Innovation implementation in work teams. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 245–276). New York: Oxford University Press.

Wicklund, R. A. (1980). Group contact and self-focused attention. In: P. B. Paulus (Ed.), *Psychology of group influence* (pp. 189–208). Hillsdale, NJ: Lawrence Erlbaum.

Wittenbaum, G. M., & Bowman, J. M. (2004). A social validation explanation for mutual enhancement. *Journal of Experimental Social Psychology*, *40*, 169–184.

Ziegler, R., Diehl, M., & Zijlstra, G. (2000). Idea production in nominal and virtual groups: Does computer-mediated communication improve group brainstorming? *Group Processes and Intergroup Relations*, *3*, 141–158.

DOMINANCE COMPLEMENTARITY AND GROUP CREATIVITY

Scott S. Wiltermuth

ABSTRACT

Dominance complementarity, which is the tendency for people to respond oppositely to others along the control dimension of interpersonal behavior, is a means by which people create and perpetuate informal forms of interpersonal hierarchy within social relationships (Tiedens, Unzueta, & Young, 2007b). In the present chapter, I explore the likely effects of such complementarity on group creativity. I propose specifically that expressions of dominance, even those borne not out of formal hierarchy but rather out of such factors as expertise and enthusiasm for the task, are likely to elicit submissive responses from fellow group members when the group is trying to generate creative ideas. As group members behaving submissively are likely to contribute fewer ideas to group discussion, I argue that group members who behave dominantly may, through their influence on other group members, reduce both the number and diversity of ideas generated within the group. I, therefore, propose that dominance complementarity may impair groups' abilities to generate creative ideas.

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INTRODUCTION

Creativity researchers have long known that the presence of formal hierarchy can stifle creativity within groups (Amabile, 1988; Choi, 2007; Mullen, Johnson, & Salas, 1991; Paulus & Yang, 2000). When the boss is present, lower-status group members often become anxious about contributing their own ideas to group discussion and they become eager to concur with the boss's ideas. In short, they often respond to the presence of their boss by deferring and acting submissively. Because these submissive group members' insights are not shared in group discussion, the group generates fewer ideas; moreover, the ideas generated are less diverse because they do not come from the whole group. As such, groups in which there is a strong hierarchy are often not as able to produce creative ideas as egalitarian groups.

But does the danger stop with formal hierarchy? I argue that naturally emerging patterns of dominance and submissiveness that stem not from formal roles, but rather out of naturally emerging forms of social hierarchy could also stifle group creativity if those patterns emerge within the idea generation stage of the creative process. As such, I conjecture that even such factors as perceived expertise in a task or enthusiasm for a task could lead group members to behave dominantly and, in so doing, impair group creativity. I theorize that because people tend to respond to friendly or cooperative dominance behaviors with submissive behaviors, even those dominance behaviors borne out of good intentions may lead other group members to behave submissively by refraining from voicing their own views. Thus, the behaviors of an enthusiastic boss or even an enthusiastic peer could affect the diversity of views raised in a group in the same ways that do the behaviors of a domineering boss. Consequently, it may not be enough for managers to monitor the presence of formal forms of hierarchy in creative groups. Rather, managers may need to ensure that subtle forms of dominance that stem not from a desire to dominate but rather from a desire to actively participate in a creative group do not lead others in the group to match that dominance with submissiveness.

To explore how dominance complementarity, or the tendency for people to respond to dominant behaviors with submissive behaviors and submissive behaviors with dominant behaviors, affects the ability of groups to create new ideas, I first discuss how the creative process unfolds within individuals and within groups. I focus on the idea generation stage of the creative process – the stage in which behaviors communicating dominance and submissiveness are likely to be most harmful. I then discuss how social hierarchy is likely to emerge in work groups and describe the dominant and submissive behaviors that characterize this hierarchy. Thereafter, I hypothesize how the dynamics of dominance and submissiveness are likely to affect the ability of the group to generate creative ideas. Throughout, I use the interpersonal circumplex model (Wiggins, 1979, 1982) as a lens to examine how expressions of dominance are likely to impair group creativity.

GENERATING CREATIVE IDEAS

As creative ideas are defined as those that are both novel and useful (Amabile, 1983; Mednick, 1962; Rothenberg, 1990; Sternberg, 1988a; Weisberg, 1988), people striving to produce creative ideas must ensure that their ideas satisfy both criteria. How do people accomplish this? According to evolutionary models of the creative process (Campbell, 1960; Simonton, 1999) people generate creative ideas through the processes of variation and selection. As Guilford (1950) explains in his model of creativity, people who generate creative ideas first make connections between previously unconnected concepts and then later evaluate those novel connections to determine which are useful and deserving of further thought. Variation in thought produces novel ideas, and selection works to ensure that only the ideas that are not only novel but also useful survive.

While such models of the creative process may sound strikingly similar to Darwin's model of organic evolution, the variation in ideas leading to creativity may not necessarily be blind or random, as it is in Darwin's model. Rather, the degree of variation may be influenced by the number and content of knowledge elements or concepts within the creator's mind, the degree to which the creator considers those elements to be relevant to the problem at hand, and the processes the creator uses in combining those elements (Simonton, 1999). The more knowledge elements the creator has available and the greater the variety of elements the creator perceives to be relevant, the higher the likelihood that the creator will generate the unusual mental connections that are the basis for novel ideas (Langley & Jones, 1988; Sternberg, 1988b). As such, individual-level characteristics ranging from previous experiences to cognitive flexibility may influence the number and variety of ideas an individual creator is likely to generate.

Just as the characteristics of an individual creator influences his/her creative potential, so too do the characteristics of a group influence its creative potential. The composition of a group, the processes the group uses to generate ideas, the task-focus of group members, the stability of the group, and the interpersonal dynamics occurring within the group may all affect a group's ability to effectively generate ideas (Bantel & Jackson, 1989; Choi & Thompson, 2005; Diehl & Stroebe, 1987; Jehn, Northcraft, & Neale, 1999; Kurtzberg & Amabile, 2001; Milliken, Bartel, & Kurtzberg, 2003; Nemeth & Staw, 1989; Nijstad, Diehl, & Stroebe, 2003). If a group is composed of very diverse individuals who hold varied sets of ideas, the group will have a greater opportunity to form unusual mental connections between ideas than if group members hold similar ideas or if the group's conversation centers on those ideas they have in common (Amabile, 1988; Ancona & Caldwell, 1992; Hoffman, 1959; Hoffman, Harburg, & Maier, 1962; Nemeth, 1986; Nemeth & Staw, 1989; Woodman, Sawyer, & Griffin, 1993). Moreover, the better a group can bring out unique ideas through group discussion and identify those ideas as potentially relevant to the creative task, the better the group's chances of generating a large number of novel, and potentially creative, ideas (Amabile, Conti, Coon, Lazenby, & Herron, 1996). After all, if the group can choose among a large number of diverse ideas, the group is likely to select more creative ideas than if few ideas have been raised for discussion or if the ideas that are raised are similar to one another.

FORMAL HIERARCHY AND GROUP CREATIVITY

As the previous discussion implies and significant research demonstrates, the composition of a group can drastically affect a group's ability to create new ideas. From a manager's perspective, one obvious lesson from this research is to include people with a variety of different ideas and perspectives when designing groups tasked to be creative. This, however, may be easier said than done. Managers may not always have the human resources to ensure that group members bring diverse perspectives to creative tasks. Further, they may not be able to recognize which potential group members will bring diverse ideas to the groups even when diversity in perspectives exist, as easily identifiable differences such as race, gender, and seniority may not correspond to actual differences in perspectives (Phillips & Loyd, 2006).

So what levers can managers pull when assembling and managing creative teams? To identify these levers, researchers have devoted considerable effort to identifying situational and dispositional factors that influence group creativity (e.g., Amabile, Barsade, Mueller, & Staw, 2007; Amabile et al., 1996; Ford, 1996; James, Brodersen, & Eisenberg, 2004; Oldham & Cummings, 1996). Group cohesiveness, group size, group diversity, and relational demography all have been shown to influence creativity in groups (see Woodman et al., 1993 for a review). So too have been the processes groups use to generate ideas (e.g., brainstorming, Delphi technique, nominal group technique) (Dalkey, 1968; Diehl & Stroebe, 1987; Stroebe & Diehl, 1994; Van de Ven & Delbecq, 1974). Other research has shown that groups with individualistic orientations are more creative than are those with communal orientations (Goncalo & Staw, 2006). Still other research has found that groups in which people feel a sense of personal autonomy, self-efficacy, or intrinsic motivation are more creative than are other groups (Amabile et al., 2007; Barron & Harrington, 1981; Ford & Kleiner, 1987; Redmond, Mumford, & Teach, 1993). Potentially driving these findings, Fodor and Greenier (1995) found that individuals who are high in power motive tend to be more creative than those low in power motive.

Most relevantly for the current chapter, past research has also found that introducing formal hierarchy into a group may limit its ability to be creative (Alencar & Bruno-Faria, 1997; King & Anderson, 1990; O'Reilly & Flatt, 1989). For example, Choi (2007) found that work teams consisting of people of disparate hierarchical status displayed less creative behavior than did teams consisting of people of more similar status. Moreover, Mullen et al. (1991) found that groups produced fewer creative ideas when an authority figure was present during the idea generation process. They hypothesized that performance anxiety of junior members intimidated by the authority figures may have explained the performance decrements on the creative task. Further, Janis (1972) suggests that groupthink can be exacerbated and fewer ideas generated hierarchies are salient within groups.

Scholars have also noted that hierarchy is also likely to have a negative impact on creativity at the organizational level. Shalley & Gibson (2004) have noted that bureaucratic or hierarchical organizations may not encourage their employees to find innovative solutions to workplace problems, whereas flatter structures may spur people to take creative approaches to their work. Consistent with this logic, more authoritarian organizations have been observed to be less innovative than less authoritarian organizations (Hage & Aiken, 1969).

Taken together, the research indicates that the presence of formal hierarchy within groups leads lower-status group members to disengage from the creative process. Low-status group members may behave submissively, deferring to their bosses either by not offering their own ideas or by latching on to their bosses' ideas and offering related ideas. In fact, hesitance to openly express one's own point of view may be part and parcel of being a low-status member of a group when a high status or authoritative figure is present. Managers designing and supervising creative groups would therefore be well advised to monitor how hierarchically differentiated those groups are. As Fodor and Grenier's (1995) work on the influence of power motive on creativity suggests, many individuals (particularly those high on the motive for power) are most creative when they feel powerful.

DOMINANCE, SUBMISSIVENESS, AND NATURALLY EMERGING FORMS OF SOCIAL HIERARCHY

Managers who strive to ensure that creative teams are not strongly differentiated in terms of formal hierarchy will likely improve those teams' ability to generate creative ideas. These efforts alone, however, are unlikely to rid teams of social hierarchy entirely. As Tiedens and Fragale (2003) point out, when people begin working with others they quickly figure out who is dominant and who is submissive. Even when teams are initially egalitarian and there are no preexisting status differences, some group members come to exhibit dominance behaviors that place them toward the top of the social hierarchy and other group members come to exhibit submissive behaviors that place them lower on the social hierarchy. In fact, both humans and nonhuman primates have been shown to naturally arrange themselves into social hierarchies within groups (de Waal, 1982; Eibl-Ebbesfeldt, 1989; Goodall, 1971; Lonner, 1980; Murdock, 1945; Wright, 1994).

Group members use both nonverbal and verbal forms of behavior to navigate hierarchies and establish their place in them (e.g., Hall, Coats, & Le Beau, 2005). To establish dominance and entrench themselves at the top of hierarchies, people generally try to make their bodies appear larger. They may stretch their arms out to their sides or they may place on their hips, they may extend their legs, widen their knees while standing or sitting, make large gestures, and reduce interpersonal distances. They may also stand when others are sitting, stare at others while they speak and look away while others are speaking. Individuals wishing to establish dominance may also speak in a loud voice and interrupt others often. Group members wishing to signal submissiveness generally try to present themselves as smaller as to appear less threatening. They may maintain interpersonal distances, keep their arms in toward the body, avert their eyes while speaking, look downward, and make small gestures. They use qualifiers in their speech and do not present their ideas assertively.

The tendency for people to arrange themselves into informal social hierarchies through dominant and submissive behaviors has important implications for groups striving to generate creative ideas. The positions people occupy on these hierarchies affect how they behave, the rewards they accrue, and the responsibilities they take on (Keltner, Gruenfeld, & Anderson, 2003; Tiedens & Fragale, 2003). They can also affect the structure of conversations, leading dominant or high-status group members to direct and sometimes monopolize discussion and submissive or low-status group members to follow the conversational lead of others and participate less in the group discussion. By affecting these variables, social hierarchies created through the displays of dominance and submissiveness may affect the ability of groups to generate creative ideas.

The Interpersonal Circumplex Model

The interpersonal circumplex model provides a useful theoretical lens to examine both how social hierarchy is likely to emerge in groups and how this social hierarchy is likely to affect group creativity. Adherents of this model posit that behavior can be described along the two orthogonal dimensions of affiliation and control (Carson, 1969; Kiesler, 1983; Leary, 1957; Wiggins, 1979, 1982). Importantly, these theorists also stress that people regularly respond to others' behavior in predictable ways that complement the eliciting behavior along both the control dimension and the affiliation dimension of interpersonal behavior. Specifically, people are said to assimilate with others on the affiliation dimension by behaving agreeably with those who behave agreeably toward them and by quarreling with those who quarrel with them (Carson, 1969; Horowitz et al., 1991, 2006; Kiesler, 1983). Conversely, people contrast with others on the control dimension by behaving submissively toward those who behave dominantly toward them and by behaving dominantly toward those who behave submissively toward them. Thus, when one person in a group behaves dominantly, his/her interaction partners are likely to behave submissively in response. This tendency to contrast with interaction partners on the dominant/submissive dimension of behavior is known as dominance complementarity and is often the chief mechanism by which people establish social hierarchies (Tiedens & Fragale, 2003; Tiedens, Chow, & Unzueta, 2007a).

Numerous studies provide evidence that people regularly contrast others' behavior on the control dimension and mimic others' behavior on the affiliation dimension (Dryer & Horowitz, 1997; Estroff & Nowicki, 1992; Horowitz et al., 1991; Locke & Sadler, 2007; Sadler & Woody, 2003; Strong et al., 1988; Tracey, 1994, but see also Nowicki & Manheim, 1991; Orford, 1986). For instance, people who face others with dominant (i.e., open and expansive) bodily postures tend to adopt submissive (i.e., constricted) bodily postures and people who face others with submissive bodily posture tend to respond with dominant posture (Tiedens & Fragale, 2003). Further, those who act dominantly by speaking in a loud voice or trying to control the interaction very often have their behaviors met with submissive responses (Markey, Funder, & Ozer, 2003). Thus while dominant behaviors are not always met with submissive behaviors and submissive behaviors are not always met with dominance behaviors, in many contexts dominance seems to invite submissiveness and submissiveness seems to invite dominance (Horowitz et al., 2006).

Why Do People Act Complementarily?

Dominance complementarity may emerge naturally because it is generally experienced as pleasant. Using the Desert Survival Task (Lafferty & Eady, 1974), Dryer and Horowitz (1997) found that participants who solved a problem with another person were more satisfied with the interaction if they were paired with a complementary partner. Moreover, Tiedens and Fragale (2003) found that participants interacting with a confederate who responded to them complementarily along the dominant/submissive dimension felt more comfortable and liked the confederate more than did those who matched dominance with dominance and those who matched submissiveness with submissiveness. Interestingly, in neither study did the person behaving submissively in response to dominance feel less comfortable in the interaction or like their partner less than did the person behaving dominantly. Indeed, complementarity appears to reliably result in increased levels of liking and comfort (Estroff & Nowicki, 1992; Horowitz et al., 1991; Sadler & Woody, 2003). Thus, one of the social goals of people acting dominantly and people acting submissively may be to establish a comfortable relationship in which there is strong goal clarity (Tiedens et al., 2007a).

Importantly, these tendencies to contrast with interaction partners are strengthened in many of the contexts in which groups tasked to be creative operate. Specifically, complementarity reliably occurs in cooperative contexts but not in hostile or competitive contexts (Billings, 1979; Blumberg & Hokanson, 1983; Horowitz et al., 2006; Markey et al., 2003; Nowicki & Manheim, 1991; Orford, 1986; Tracey, 1994, 2004). Strong et al. (1988) found that participants responded to dominance with submissiveness and to submissiveness with dominance only when they interacted with friendly confederates. When confederates were unfriendly such complementary behavior did not occur. Similarly, Sadler & Woody (2003) found that in cooperative interactions people responded to dominance with yielding behavior and yielding behavior with dominance. Moreover, Tiedens et al. (2007b) found that when participants were told that a task was cooperative, they perceived their counterpart as complementing themselves, but that if the same task was framed as competitive these perceptions did not occur.

People also seem to be particularly likely to respond to dominance with submissiveness and submissiveness with dominance when they are working on defined tasks with other people. Dominance complementarity occurs more reliably in work-settings than in nonwork settings (Moskowitz, Ho, & Turcotte-Tremblay, 2007), and when people work on cooperative or competitive tasks rather than unstructured tasks (Markey et al., 2003). Also suggesting that complementarity may be most pronounced when people are working on tasks, people seem to be motivated to see others as complementary along the control dimension of behavior when they expect that they will be working together on an upcoming cooperative task but do not hold such motivated perceptions when they do not anticipate working together (Tiedens et al., 2007b). As such, people at least unconsciously see value in behaving complementarily when completing tasks with others. People acting dominantly and people acting submissively may, therefore, share two important goals even though they take different roles in accomplishing those goals. Each may be looking for a comfortable relationship, and each may be looking to perform well on tasks (Tiedens et al., 2007a).

In sum, there are numerous reasons to believe that people working together on creative tasks in groups might match fellow group members' dominance with submissiveness and their submissiveness with dominance. Specifically, dominance complementarity emerges naturally in a variety of settings, is experienced as pleasant by both people behaving dominantly and submissively, is stronger in cooperative settings and when people work on tasks together, and is stronger in work than nonwork settings.

Translating Dominance Complementarity to the Group Level

The findings that people create hierarchical relationships by signaling dominance and submissiveness in dyadic relationships have clear relevance for those wishing to understand how groups function. Chiefly, they imply that purportedly egalitarian groups may not be truly egalitarian. By dint of personality, expertise, enthusiasm, or a desire to control the interaction, some group members may start exhibiting dominant gestures or behaviors. Zealous group members may be seen as dominant group members, as might group members who act as though they have expertise in a particular domain. If people do start behaving in ways that are seen as dominant by other group members, others within the group may respond to this dominance with submissiveness. Driven by the comfort and liking these complementary interactions create, participants may perpetuate these hierarchies once they exist by continuing to behave dominantly or submissively (Tiedens & Fragale, 2003).

The findings also imply that groups may split along dominant/submissive lines even when group members are not aware that they are behaving either dominantly or submissively. Multiple studies have shown that this sorting process can occur without participants in it ever being consciously aware of the interpersonal dynamics at play (Dryer & Horowitz, 1997). As Tiedens and her coauthors (Tiedens & Fragale, 2003; Tiedens et al., 2007a) argued, participants may be motivated by the comfort and liking produced by complementary patterns of interaction or by the potential task-performance benefits of complementarity and never consciously realize that they are acting complementarily.

While much can be learned from research on complementarity conducted at the dyadic level, future research could productively look specifically at how the dynamics of dominance and submissiveness play out in groups and affect the performance of those groups, as much remains unknown. People may respond to a single leaders' dominance with submissiveness and behave neither dominantly nor submissively toward others in the group. Alternatively, they may form transitive hierarchies within groups such that if Group Member A acts dominantly toward Group Member B, and Group Member B acts dominantly toward Group Member C, then Group Member A would act dominantly toward Group Member C. Similarly, it is possible that the interpersonal dynamics of people within a group are much more specific to relationships between individuals. Group Member A may act dominantly toward Group Member B and Group Member B may act dominantly toward Group Member C, but Group Member A may act submissively toward Group Member C. Regardless of which patterns of dominance and submissiveness describe relationships within a particular group in a particular domain, individuals who behave dominantly may lead one or more of their group mates to behave submissively.

EFFECTS ON GROUP CREATIVITY

Because a number of situational factors could make complementary patterns of behavior likely to occur in creative work groups, it is worth understanding how the tendency to respond to dominance with submissiveness and to submissiveness with dominance affects group creativity. Certainly, if dominance complementarity affected groups' creative output as positively as it seems to affect relational satisfaction, groups striving for creativity would be well advised to behave complementarily. But do dominance complementarity and the hierarchy created by it improve group creativity?

While no research has directly examined this issue, a number of articles have examined the impact of dominance complementarity on other types of group performance. These studies may provide some clues as to the likely impact of complementarity on creativity. As such, I begin the following section with a review of this literature. I then examine explicitly how the hierarchy created through dominance complementarity may affect the creative process in groups by altering the structure of group discussion. Subsequently, I discuss the potential impact on group creativity of complementarity's positive affective consequences, which include increased liking of counterparts and increased comfort with and enjoyment of the interaction (e.g., Dryer & Horowitz, 1997; Tiedens & Fragale, 2003). I examine explicitly how dominance complementarity might affect idea generation by influencing the amount of competition within the group.

Dominance Complementarity and Group Performance on Social Tasks

Early work on interpersonal theories (Kiesler, 1983; Sullivan, 1953) has suggested that anticomplementary patterns of interaction could reduce the productivity of social interactions. Supporting this proposition, Tracey and Sherry (1993) found that higher quality training of psychologists resulted when the trainee's behavior and the mentor's behavior were complementary. Wiltermuth, Tiedens, and Neale (2007) provided similar support in showing that negotiating dyads comprised of one negotiator behaving dominantly and one negotiator behaving submissively reached higher quality agreements than did dyads in which either both negotiators behaved submissively or both negotiators behaved dominantly. Finally, Estroff and Nowicki (1992) showed that participants in complementary dyads were better at solving jigsaw puzzles than were anticomplementary dyads.

It is, therefore, clear that behaving complementarily can improve performance in some types of tasks. However, the benefits of complementarity may not extend to all types of tasks. In fact, Dryer and Horowitz (1997) found that complementary dyads performed less well in a Desert Survival Problem (Lafferty & Eady, 1974) than did anticomplementary dyads, even as the complementary dyads reported enjoying the experience more than did those in the anticomplementary dyads. Similarly, Estroff and Nowicki (1992) showed that dominance complementarity did not significantly improve performance on word-generation tasks. Moreover, while a number of studies of complementarity have participants complete tasks with objectively measurable outcomes, the effect of dominance complementarity on these outcomes is rarely reported – a pattern of reporting that would be more curious (and unlikely) if dominance complementarity were systematically improving performance.

Based on these results, Tiedens and Jimenez (2003) have suggested that dominance complementarity might be most facilitative of performance when tasks require coordination, as complementarity creates a sense of hierarchy within a dyad or group and hierarchy as a relational form can help people efficiently coordinate activity and allocate resources (Leavitt, 2004; Weber, 1946). Such a characterization fits well with Estroff and Nowicki's (1992) data showing that participants in complementary dyads outperformed those in anticomplementary dyads on the relatively coordination-intensive task of solving jigsaw puzzles, but did not outperform those dyads on a less coordination-intensive word-generation task. It also fits well with the finding that negotiators in complementary dyads are better able to coordinate the information search necessary to discover high quality agreements in integrative negotiations (Wiltermuth et al., 2007). Finally, it is consistent with Tiedens, Unzueta, & Young's (2003) finding that roommates who prioritized coordination goals with their roommates viewed their roommates as contrasting with them on the dominance/submission dimension of behavior whereas those who did not prioritize coordination did not view their roommates as contrasting with them. Thus, informal social hierarchy does seem to improve performance on a number of types of social tasks (Estroff & Nowicki, 1992; Tracey & Sherry, 1993; Wiltermuth et al., 2007).

Although matching dominance with submissiveness may enhance group performance in many tasks, it is unlikely to be the ideal interaction style for all tasks. In particular, dominance complementarity may have detrimental effects on group performance when performance is dependent upon the

Table 1. Variables Affected by Complementarity that Are Likely to Affect Group Creativity.

Hierarchy	Comfort in Interaction
Sense of personal autonomy	Positive affect
Willingness to voice ideas	Willingness to voice ideas
Turn-taking in group discussion	Fear of evaluation
Independence of perspectives	Willingness to critique others' ideas
Coordination of information exchange	Competitiveness of interaction

emergence of multiple perspectives, as is the case with creativity. Complementarity may lead group members behaving submissively when working on creative tasks to refrain from voicing their ideas – a cost that could outweigh the benefits that complementarity has shown in other types of tasks. Driven by this possibility, the following section investigates how dominance complementarity affects group creativity (Table 1).

Effects Caused by Emergence of Hierarchy

When a person acts submissively in an interaction, the person risks losing his/her sense of personal autonomy. As personal autonomy has been shown to be a key component in the personality of creative individuals (Barron & Harrington, 1981) as well as a factor driving creativity within organizations (Amabile et al., 1996; Bailyn, 1985; Paolillo & Brown, 1978), the loss of that sense of autonomy may reduce the likelihood that the individual will contribute to the group's efforts to be creative. In particular, he or she may be less willing to share ideas. If submissive group members share fewer ideas, the total number of ideas generated by the group should fall. The diversity of ideas generated by the group should also fall, as the ideas coming from one subgroup (i.e., those behaving submissively) are relatively unlikely to surface. Both the reduction in the number and variation of the ideas surfaced at the group level should reduce group creativity.

If there are systematic differences in the backgrounds or perspectives of those acting dominantly and those acting submissively, the diversity of the group's ideas may be particularly at risk. For example, if a group of marketers were to act dominantly in a discussion with engineers and the engineers were to respond submissively, the group may produce ideas that are not informed by the engineering perspective. Not only would fewer ideas generated by the engineers be raised in group discussion, the ideas generated by the marketers would be commented upon less by the engineers.

One of the hallmarks of submissive behavior is deference to others. Carried to an extreme, deference to others may mean that the ideas of those others would go unchallenged and, by consequence, unimproved. This may mean that submissive group members would show deference by remaining relatively quiet and not sharing ideas or it may mean that they display deference by sharing ideas that are similar to those already raised. In either case submissive group members would contribute few new ideas to the discussion.

Even if submissive group members fully intend to voice their ideas but wait to do so, group creativity may be reduced. When group discussion forces people to take turns to share their ideas, individuals tend to produce fewer ideas (Diehl & Stroebe, 1987, 1991). As Diehl and Stroebe explain, ideas can come and go fairly rapidly during group discussion and delays in being able to voice those ideas might lead people to forget their ideas before having a chance to voice them. Similarly, turn-taking might lead conversation to move to new ideas before group members have a chance to contribute ideas on a related vein. Turn-taking would therefore not only reduce the total number of ideas generated within a group but also the quality of ideas.

While people acting dominantly would likely eschew the idea of waiting their turn to present their ideas in group discussion, those behaving submissively would likely wait for opportunities in the conversation. If so, such group members would voice fewer ideas and would be less able to immediately offer suggestions that would make others' ideas more novel or useful. Moreover, if submissive group members hesitate to offer their ideas, other group members may follow their lead and also refrain to offer ideas, as people tend to match their productivity with those in the group who present the fewest ideas (Paulus & Dzindolet, 1993). Group creativity, and particularly the idea generation component of creativity, would therefore be impaired if some group members behaved submissively and hesitated in sharing ideas.

Because creativity comes not from consensus but rather from dissent or deviation from consensually held ideas (Nemeth & Staw, 1989), groups composed of members possessing independent perspectives are likely to be more creative than are groups with fewer independent perspectives. Complementarity may reduce the number of perspectives within a group by accelerating the rate at which ideas within a group converge. After all, people acting complementarily are unconsciously attuned to the nonverbal behavior of their interaction partners and are modifying their own behavior in response. If the social attunement effected by dominance complementarity prematurely leads people to think along the same lines as their interaction partners, dominance complementarity may reduce the number and variety of ideas discussed by groups.

For all these reasons, the hierarchy introduced by dominance complementarity would likely hamper group creativity. However, these hierarchy-driven effects may not tell the whole story. In addition to creating hierarchy, dominance complementarity leads people to feel good about their interactions and comfortable with one another.

Effects Caused by Affective Consequences of Complementarity

Dominance complementarity may affect group creativity through affective processes. Dominance complementarity can alter group member's liking of and comfort with one another; it can lead them to enjoy interactions more; and it can make group interactions feel less competitive (Dryer & Horowitz, 1997; Tiedens & Fragale, 2003). As these factors have been shown to influence people's willingness to share unique information and ideas (Gruenfeld, Mannix, Williams, & Neale, 1996; Nemeth & Ormiston, 2007), dominance complementarity may not only affect the group creativity directly through the establishment of dominant and submissive group members, but also indirectly by changing the way group members feel toward each other and toward the creative task. In other words, dominance complementarity may not only imply that group members' behaviors are separated on the control dimension of the Interpersonal Circumplex (i.e., some members behave dominantly and some behave submissively), it may imply that group members' behaviors tend to be congregated on the warmer side of the affiliation dimension. Fig. 1 displays the theorized dispersion of behaviors on the Interpersonal Circumplex if one group member were to begin behaving dominantly and friendly and other group members were to respond in the hypothesized friendly and submissive manners. The discussion that follows addresses the likely effects of the increases in positive affect, comfort with group members, and reduced feelings of competitiveness on group creativity.

Affective Consequences

Positive Moods

Substantial research has demonstrated that positive moods facilitate creativity when groups hold a creative goal (Amabile, 1983; Amabile,

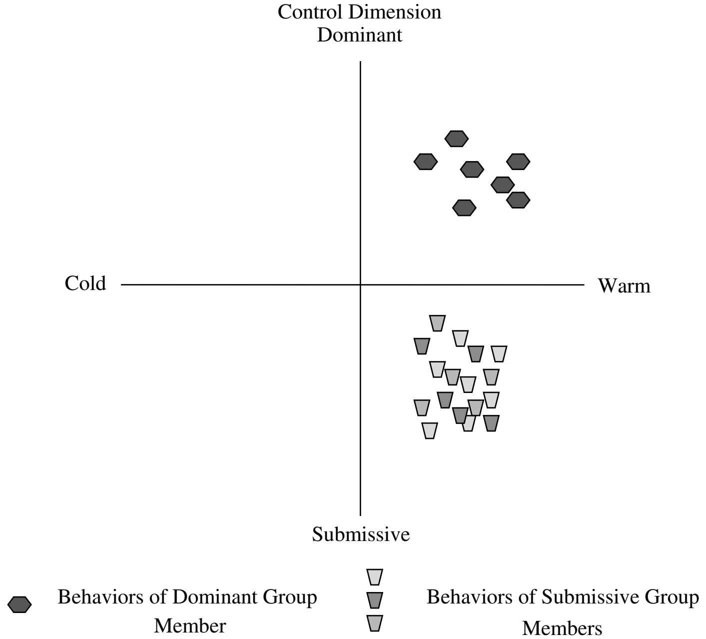

Fig. 1. Interpersonal Circumplex Model Displaying Complementary Behaviors of a Dominant Person and Several Submissive People within a Group.

Barsade, Mueller, & Staw, 2005; Carnevale & Isen, 1986; Forgas, 2000; Greene & Noice, 1988; Hirt, 1999; Hirt, McDonald, & Melton, 1996; Isen, Johnson, Mertz, & Robinson, 1985; Madjar, Oldham, & Pratt, 2002; Russ, 1993, 1999; Staw et al., 1994; Staw & Barsade, 1993; Schwarz, 2000; Shapiro & Weisberg, 1999; Shapiro, Weisberg & Alloy, 2000; but see also George & Zhou, 2002; Kaufmann, 2003a; Kaufmann & Vosburg, 1997, 2002; Vosburg & Kaufmann, 1999; Szymanski & Repetto, 2000 for counterexamples). Isen (1998, 1999) argues that positive affect leads to creativity because it (1) increases the amount of cognitive elements available for association, (2) decreases focus, which leads people to consider more cognitive elements to be relevant to a particular context, and (3) increases cognitive flexibility, which leads people to make more connections between dissimilar elements. Consistent with this reasoning, Clore, Schwarz, and Conway (1994) have shown that positive moods increase cognitive variation. Similarly, Fredrickson (1998, 2001) proposed that positive emotions "broaden and build" one's repertoire of actions and thoughts, which leads people to focus less on established combinations of cognitive elements and more on potentially new combinations of cognitive elements when creating novel ideas. Supporting these models, Isen and her colleagues have shown that induced positive moods lead people to generate more unusual word associations (Isen et al., 1985) and perform better on tests of ingenuity (Isen, Daubman & Nowicki, 1987; Estrada, Isen, & Young, 1994) and flexible problem solving (Isen and Daubman; Isen, Niedenthal, and Cantor, 1992; Carnevale & Isen, 1986). Expanding upon these findings, Amabile and her colleagues (2005) found that positive affect precedes creative thought within organizational contexts.

As complementarity leads people to enjoy their interactions (e.g., Sadler & Woody, 2003), and positive affect leads people to produce more unusual associations between cognitive elements, complementarity should help people to generate novel ideas when they have a creative goals. Will these ideas also be useful? Ample evidence suggests that positive moods enhance performance on the first stage of the creative process. However, there is less evidence showing that positive moods lead people to more effectively evaluate which of the new ideas they have generated are worthwhile (Vosburg, 1998). In fact, positive moods have more reliably been tied to heuristic modes of processing (i.e., "shallow thinking") than to the systematic modes of processing (i.e., "deep thinking") likely to be most helpful when evaluating ideas (e.g., Forgas, 2000). Consistent with this idea, a recent meta-analysis (Davis, 2007) revealed that the creativity benefits of positive mood disappear when tasks require the creative output to be both novel and useful. In other words, people in positive moods generated more novel ideas, but they did not generate more ideas that were both novel and useful. Groups in which people respond to others' dominance with submissiveness and others' submissiveness with dominance may therefore be likely to generate more novel ideas, but they may not necessarily produce more useful (and ultimately creative) ideas.

Comfort

Much of the positive affect generated by dominance complementarity is related to the comfort people in complementary interactions experience. (Estroff & Nowicki, 1992; Horowitz et al., 1991; Lafferty & Eady, 1974; Sadler & Woody, 2003). When people feel more comfortable with others, they may be less fearful about their ideas being evaluated, and they may therefore be more willing to share their ideas (Anderson & West, 1998; Camacho & Paulus, 1995). This increased sharing of ideas would presumably increase the number of ideas discussed by groups attempting to produce creative ideas. It would also likely increase the variety of ideas discussed, as fear of evaluation would likely prevent people from sharing the most deviant ideas because these ideas are likely to elicit the harshest criticism (Diehl & Stroebe, 1987; Moscovici, 1976) and comfort with others should attenuate the fear of evaluation.

However, if comfort with one another leads group members to be complacent or unwilling to engage in the task conflict necessary to generate novel ideas, groups may actually produce fewer creative ideas (Nemeth & Staw, 1989). In fact, Nemeth and Ormiston (2007) found that groups who were more comfortable with each other because of stable group memberships actually generated fewer creative ideas than did groups who felt less comfortable with one another because of changing group memberships. Thus, the comfort generated from complementarity may not have an unambiguously positive effect on groups' ability to generate novel ideas.

Competition

The tendency of people to respond to dominance behavior with submissive behaviors may lead group members to perceive and experience lower levels of competition within the group. Scholars have long debated the impact of competition on creativity. Some studies have found that competition constrains creativity (Amabile, 1982; Brown & Gaynor, 1967; Deci, Betley, Kahle, Abrams, & Porac, 1981; Deci & Ryan, 1980; McGlynn, Gibbs, & Roberts, 1982). Other studies have found that competition can fuel creativity (Abra, 1993; Clydesdale, 2006; Cummings & Oldham, 1997; Eisenberger & Cameron, 1996; Raina, 1968; Torrance, 1965).

Why have the findings on conflict and competition been so inconsistent? Garczynski's (1996) cognitive evaluation theory suggests that competition can have two contrasting effects. It may either reduce creativity by instilling pressure to achieve or boost creativity by promoting a desire for mastery of the task. Consistent with this, much of the research demonstrating a negative link between competition and creativity has cited decreased intrinsic motivation as the mechanism by which competition impairs creative performance (Clydesdale, 2006). Therefore, if group members discussing creative ideas feel as though the discussion has become overly competitive, they might lose interest and stop contributing ideas.

If complementarity reduces group conflict and lessens group members' feelings that they are competing with other group members to produce the most creative ideas, one might expect complementarity to reduce feelings of competition and therefore facilitate creativity. However, it is not clear that having many people actively voicing their ideas in a group setting, as might happen when people do not behave complementarily, will undermine intrinsic motivation in the same ways that do more explicit forms of competition. Moreover, a number of authors have noted that feelings of competition can fuel creativity. Specifically, Sutton and Hargadon (1996) found that competition fueled creativity during brainstorming sessions at a product design firm, and Clydesdale (2006) showed that the competition between John Lennon and Paul McCartney helped the pair to produce such high levels of creative output. Further, Goncalo and Staw (2006) showed that groups with communal orientations produced less creative ideas for the space vacated by a university restaurant than did groups with individualistic orientations, even when given explicit instructions to be creative. Thus, dominance complementarity could even impair group creativity by attenuating feelings of competitiveness.

Reducing the competitiveness of interactions may help groups trying to select one idea among the list of ideas generated by the group. Specifically, reduced competitiveness may weaken people's attachment to their own ideas and make them more willing to see merit in others' ideas. Additionally, it may lead group members to make more constructive comments than they might have done if the idea selection phase resembled a competition. However, if group members are unwilling to jeopardize comfort they may avoid providing negative feedback on others' ideas.

Reconciling the Effects of Complementarity on Creativity

Groups that succeed in generating novel ideas do so by creating novel connections between previously unassociated concepts (Simonton, 1999). The idea generation process, therefore, requires people to access wide-ranging concepts or knowledge elements and tie those elements together in unique ways. While the positive affect stemming from dominance complementarity may help individual members to form such connections between previously unconnected ideas, the positive affect is essentially a byproduct of a pattern of interaction within the group that likely diminishes the group's ability to generate ideas. Namely, it stems from some group members behaving submissively toward, or deferring to, dominant group members.

This deference, while polite, is not likely to be helpful if the group's goal is to generate a broad set of novel ideas. Group members who either refrain from sharing their ideas or who simply hesitate in sharing their ideas effectively remove their ideas from consideration at the group level. As a result, groups in which some group members behave submissively are likely to generate fewer ideas. They are also likely to generate less varied ideas, as when fewer people contribute ideas those ideas tend to be less diverse. Thus, by creating a hierarchy within a group, dominance complementarity may reduce both the number and variety of ideas a group generates.

Would the negative effects of some group members behaving submissively outweigh the potential benefits stemming from the positive affective consequences of complementarity? I would argue that they would do so for two reasons. First, the positive affective consequences of complementarity seem to be driven largely by increased comfort and decreased competition. As Nemeth & Ormiston (2007) point out, increased comfort with others can increase the perception of creativity while actually causing decrements in group creativity. Some level of conflict and individualistic orientation (Staw & Goncalo, 2006) may enable groups to generate a broader set of ideas. Second, even if the positive affect and comfort associated with dominance complementarity stimulated some group members to put forth more or more novel ideas, it seems unlikely that these gains would compensate for the loss of the perspectives of those acting submissively.

In sum, dominance complementarity may influence creativity either by establishing hierarchy within groups, or by leading group members to feel more comfortable in their interactions and more positively toward their interaction partners. As the increased comfort and enjoyment of the interactions are products of the hierarchy created by dominance complementarity, I argue that the hierarchical effects are likely to dominate. Thus, I argue that dominance complementarity is likely to hamper group creativity by leading some members of the group to act submissively and refrain from sharing unique ideas within the group discussion.

BOUNDARY CONDITIONS

I have argued that complementary patterns of interaction would likely impair the ability of groups to generate ideas. This argument should not be taken to mean that group creativity will always be impaired if group members form informal social hierarchies by responding to dominance with submissiveness and submissiveness with dominance. Dominance complementarity may be effective at other stages of the creative and innovation processes. To wit, numerous scholars have identified factors that can help leaders boost creativity in groups and organizations (e.g., Amabile, Schatzel, Moneta, & Kramer, 2004; Dunham & Freeman, 2000; Howell & Boies, 2004; Hunt, Stelluto, & Hooijberg, 2004; Mumford, Scott, Gaddis, & Strange, 2002).

These factors range from identifying and defining the problems worth pursuing to establishing intellectually challenging environments in which multiple parties may generate ideas to leading groups to work more efficiently in evaluating and implementing novel ideas (Mumford, Hunter, Eubanks, Bedell, & Murphy, 2007). If individuals behaving dominantly can fulfill these roles and individuals behaving submissively can follow their lead, complementary patterns of dominance and submissiveness may enhance group creativity.

Even within the idea generation stages of the creative process, there may well be instances in which complementarity boosts creativity. For example, complementarity could bring out the insights of the people who have the most expertise. If those who have expertise behave dominantly and those lacking that expertise behave submissively, the group would be more effective in generating good ideas if having expertise were required to produce novel and useful ideas. Dominance complementarity may similarly help groups generate ideas if those acting dominantly are consistently better able to provide comments that spark ideas among group members than are those group members acting submissively. In addition, complementarity may be effective if the person with the most expertise within the group behaves submissively and allows others within the group to behave dominantly. In doing so, he or she may be able to learn from the fresh perspectives offered by the less knowledgeable and still be confident in contributing his/her opinions later in the discussion.

Complementarity could also improve groups' ability to generate ideas if the majority of group members' natural inclination is not to behave dominantly by projecting their ideas but rather to behave submissively and let others carry the discussion. While groups with some people acting dominantly and others acting submissively may not produce more creative ideas than groups with everyone actively participating, they are likely to produce more creative ideas than would groups in which everyone behaves submissively.

Group creativity may also be improved by dominance complementarity when the group finds itself trapped in one way of thinking. In such instances, a group member can emerge to direct the group to different, potentially more productive lines of thinking. Moreover, when creative ideas need to be generated to meet a deadline, naturally emerging forms of social hierarchy may be very helpful. As organizations begin to stress efficient creativity, it may become increasingly necessary to direct and even end conversations intended to generate ideas.

Finally, if dominant behaviors are not viewed as attempts to lead or control but rather as signs of enthusiasm, those behaviors may engender enthusiasm in other group members. In that case, the dominant behaviors would invite and likely elicit similar behaviors from others. This would presumably increase participation in idea generation processes, thereby potentially improving group creativity. As such, complementarity may not universally impair a group's ability to generate novel ideas.

IMPLICATIONS FOR RESEARCH AND PRACTICE

As organizations often rely on groups to design innovative products, services, and processes, the tendency for people to respond to dominance with submissiveness and submissiveness with dominance may have implications for how successfully groups function when their goal is creativity or innovation. Understanding the impact of complementarity on different stages of the creative process within groups could, therefore, have several benefits. Perhaps most importantly, managers might be able to use such knowledge to better design groups and group processes. They may, for instance, work to instill a competitive dynamic within groups during idea generation stages, as complementarity does not seem to occur in competitive settings (e.g., Orford, 1986). Moreover, managers may take care to arrange meetings such that no one person or group of people are seated or standing in a dominant position.

Most directly, they may instruct people to guard against responding to dominance with submissiveness or submissiveness with dominance when creativity is a goal of the group. Group members could discuss the dangers of following others' conversational leads before creative meetings. Making salient the risk of the emergence of informal social hierarchies might lessen the strength or the impact of the informal social hierarchies that do emerge.

From an academic perspective, understanding how the tendency of people to fall into submissive and dominant roles within a group affects creativity would also be useful. For example, it may offer an additional reason why people tend to produce fewer ideas and ideas of lower quality when in groups than they do individually (Diehl & Stroebe, 1987; Mullen et al., 1991; Nijstad, Stroebe, & Lodewijkx, 2006). It might also help to shed light on the positive effects newcomers can have on group creativity (Choi & Thompson, 2005). Finally, it should help to sharpen our knowledge of how the dynamics of dominance and submissiveness help or hinder people group performance more generally.

REFERENCES

Abra, J. (1993). Competition: Creativity's vilified motive. *Genetic, Social & General Psychology Monographs*, *119*(3).

Alencar, E. M. L. S., & Bruno-Faria, M. F. (1997). Characteristics of an organizational environment which stimulate and inhibit creativity. *Journal of Creative Behavior*, *31*(4), 271–281.

Amabile, T. M. (1982). Children's artistic creativity: Detrimental effects of competition in a field setting. *Personality and Social Psychology Bulletin*, *8*, 573–578.

Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, *45*(2), 357–377.

Amabile, T. M. (1988). A model of creativity and innovation in organizations. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 10, pp. 123–167). Greenwich, CT: JAI Press.

Amabile, T. M., Barsade, S., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*, 367–403.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*, 1154–1184.

Amabile, T. M., Schatzel, E. A., Moneta, G. B., & Kramer, S. J. (2004). Leader behaviors and work environment for creativity: Perceived leader support. *The Leadership Quarterly*, *15*, 5–32.

Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization Science*, *3*, 321–341.

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, *19*, 235–258.

Bailyn, L. (1985). Autonomy in the industrial R&D laboratory. *Human Resource Management*, *24*, 129–146.

Bantel, K. A., & Jackson, S. E. (1989). Top management and innovation in banking: Does the composition of top team members make a difference?. *Strategic Management Journal*, *10*, 107–124.

Barron, F., & Harrington, D. (1981). Creativity, intelligence, and personality. In: M. Ronsenzweig & L. Porter (Eds), *Annual review of psychology* (Vol. 32, pp. 439–476). Palo Alto, CA: Annual Reviews.

Billings, A. (1979). Conflict resolution in distressed and nondistressed married couples. *Journal of Consulting and Clinical Psychology*, *47*, 368–376.

Brown, G. I., & Gaynor, D. (1967). Athletic action as creativity. *Journal of Creative Behavior*, *1*, 155–162.

Campbell, D. T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, *67*, 380–400.

Carnevale, P. J. D., & Isen, A. M. (1986). The influence of positive affect and visual access on the discovery of integrative solutions in bilateral negotiation. *Organizational Behavior and Human Decision Processes*, *37*, 1–13.

Carson, R. C. (1969). *Interaction concepts of personality*. Chicago: Aldine.

Choi, H. S., & Thompson, L. (2005). Old wine in a new bottle: Impact of membership change on group creativity. *Organization Behavior and Human Decision Processes*, *98*(2), 121–132.

Choi, J. N. (2007). Group composition and employee creative behaviour in a Korean electronics company: Distinct effects of relational demography and group diversity. *Journal of Occupational and Organizational Psychology*, *80*, 213–234.
Clore, G., Schwarz, N., & Conway, M. (1994). Cognitive causes and consequences of emotion. In: R. S. Wyer & T. K. Srull (Eds), *Handbook of social cognition* (pp. 323–417). Hillsdale, NJ: Lawrence Erlbaum.
Clydesdale, G. (2006). Creativity and competition: The beatles. *Creativity Research Journal*, *18*(2), 129–139.
Cummings, A., & Oldham, G. (1997). Enhancing creativity: Managing work contexts for the high potential employee. *California Management Review*, *40*, 22–38.
Dalkey, N. C. (1968). *Experiments in group prediction*. Santa Monica, CA: Rand.
Davis, M. A. (2007). Meta-analyzing the relationship between mood and creativity. Paper presented at Academy of Management, Philadelphia, PA.
Deci, E. L., Betley, G., Kahle, J., Abrams, L., & Porac, J. (1981). When trying to win: Competition and intrinsic motivation. *Personality and Social Psychology Bulletin*, *7*, 79–83.
Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivation processes. In: L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 13, pp. 39–80). New York: Academic Press.
Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.
Diehl, M., & Stroebe, W. (1991). Productivity loss in idea generating groups: Tracking down the blocking effect. *Journal of Personality and Social Psychology*, *61*, 392–403.
Dryer, D. C., & Horowitz, L. M. (1997). When do opposites attract? Interpersonal complementarity versus similarity. *Journal of Personality and Social Psychology*, *72*, 592–603.
Dunham, L., & Freeman, R. E. (2000). There is business like show business: Leadership lessons from the theater. *Organizational Dynamics*, *29*, 108–122.
Eisenberger, R., & Cameron, J. (1996). Detrimental effects of reward: Reality or myth? *American Psychologist*, *51*, 1153–1166.
Estrada, C. A., Isen, A., & Young, M. J. (1994). Positive affect improves creative problem solving and influences reported source of practice satisfaction in physicians. *Motivation and Emotion*, *18*, 285–299.
Estroff, S. D., & Nowicki, S. (1992). Interpersonal complementarity, gender of interactants, and performance on word puzzles. *Personality and Social Psychology Bulletin*, *18*, 351–356.
Fodor, E. M., & Greenier, K. D. (1995). The power motive, self-affect, and creativity. *Journal of Research in Personality*, *29*, 242–252.
Ford, C. M. (1996). A theory of individual creative action in multiple social domains. *Academy of Management Review*, *21*, 1112–1142.
Forgas, J. P. (2000). *Feeling and thinking: The role of affect in social cognition*. Paris: Cambridge University Press.
Fredrickson, B. L. (1998). What good are positive emotions?. *Review of General Psychology*, *2*, 300–319.
Fredrickson, B. L. (2001). The role of positive emotions in positive psychology. *American Psychologist*, *56*, 218–226.
George, J. M., & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: The role of context and clarity of feelings. *Journal of Applied Psychology*, *87*, 687–697.

Goncalo, J. A., & Staw, B. M. (2006). Individualism-collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*, 96–109.

Greene, T. R., & Noice, H. (1988). Influence of positive affect upon creative thinking and problem solving in children. *Psychological Reports*, *63*, 895–898.

Gruenfeld, D. H., Mannix, E., Williams, K. Y., & Neale, M. A. (1996). Group composition and decision making: How member familiarity and information distribution affect process and performance. *Organizational Behavior and Human Decision Processes*, *67*, 1–15.

Guilford, J. P. (1950). Creativity. *American Psychologist*, *5*, 444–454.

Hall, J. A., Coats, E. J., & Le Beau, L. S. (2005). Nonverbal behavior and the vertical dimension of social relations: A meta-analysis. *Psychological Bulletin*, *131*(6), 898–924.

Hirt, E. R. (1999). Mood. In: M. A. Runco & S. R. Pritzker (Eds), *Encyclopedia of creativity* (Vol. 2, pp. 241–250). New York: Academic Press.

Hirt, E. R., McDonald, H. E., & Melton, R. J. (1996). Processing goals and the affect-performance link: Mood as main effect or mood as input? In: L. L. Martin & A. Tesser (Eds), *Striving and feeling: Interactions among goals, affect, and self-regulation* (pp. 303–328). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Hoffman, L. (1959). Homogeneity and member personality and its effect on group problem solving. *Journal of Abnormal Psychology*, *58*, 206–214.

Hoffman, L., Harburg, E., & Maier, N. (1962). Differences and disagreements as factors in creative group problem solving. *Journal of Abnormal and Social Psychology*, *64*, 206–214.

Horowitz, L. M., Locke, K. D., Morse, M. B., Waikar, S. V., Dryer, D. C., Tarnow, E., & Ghannam, J. (1991). Self-derogations and the interpersonal theory. *Journal of Personality and Social Psychology*, *61*, 68–79.

Horowitz, L. M., Wilson, K. R., Turan, B., Zolotsev, P., Constantino, M. J., & Henderson, L. (2006). How interpersonal motives clarify the meaning of interpersonal behavior: A revised circumplex model. *Personality and Social Psychology Review*, *10*, 67–86.

Howell, J. M., & Boies, K. (2004). Champions of technological innovation: The influences of contextual knowledge, role orientation, idea generation, and idea promotion on champion emergence. *The Leadership Quarterly*, *15*, 130–149.

Hunt, J. G., Stelluto, G. E., & Hooijberg, R. (2004). Toward new-wave organizational creativity: Beyond romance and analogy in the relationship between orchestra conductor leadership and musician creativity. *The Leadership Quarterly*, *15*, 565–583.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, *52*, 1122–1131.

Isen, A. M., Johnson, M. M., Mertz, E., & Robinson, G. F. (1985). The influence of positive affect on the unusualness of word associations. *Journal of Personality and Social Psychology*, *48*, 1413–1426.

James, K., Brodersen, M., & Eisenberg, J. (2004). Workplace affect and work-place creativity: A review and preliminary model. *Human Performance*, *17*, 169–194.

Jehn, K. A., Northcraft, G. B., & Neale, M. A. (1999). Why differences make a difference: A field study of diversity, conflict and performance in workgroups. *Administrative Science Quarterly*, *44*, 741–763.

Kaufmann, G. (2003a). The effect of mood on creativity in the innovative process. In: L. V. Shavinina (Ed.), *International handbook on innovation* (pp. 191–203). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Kaufmann, G., & Vosburg, S. K. (1997). "Paradoxical" mood effects on creative problem solving. *Cognition and Emotion*, *11*, 151–170.

Kaufmann, G., & Vosburg, S. K. (2002). Mood effects in early and late idea production. *Creativity Research Journal*, *3&4*, 317–330.

Kiesler, D. J. (1983). The 1982 interpersonal circle: A taxonomy for complementarity in human transactions. *Psychological Review*, *90*, 185–214.

King, N., & Anderson, N. (1990). Innovation in working groups. In: M. A. West & J. L. Farr (Eds), *Innovation and creativity at work* (pp. 15–59). Chichester, UK: Wiley.

Lafferty, J., & Eady, P. (1974). *The desert survival problem*. Plymouth, MI: Experimental Learning Methods.

Langley, P., & Jones, R. (1988). A computational model of scientific insight. In: R. J. Sternberg (Ed.), *The nature of creativity: Contemporary psychological perspectives* (pp. 171–201). Cambridge: Cambridge University Press.

Leavitt, H. J. (2004). *Top down: Why hierarchies are here to stay and how to manage them more effectively*. Harvard Business School Press.

Locke, K. D., & Sadler, P. (2007). Self-efficacy, values, and complementarity in dyadic interactions: Integrating interpersonal and social-cognitive theory. *Personality and Social Psychology Bulletin*, *33*, 94–109.

Madjar, N., Oldham, G. R., & Pratt, M. G. (2002). There's no place like home? The contributions of work and nonwork creativity support to employees' creative performance. *Academy of Management Journal*, *4*, 757–767.

Markey, P. M., Funder, D. C., & Ozer, D. J. (2003). Complementarity of interpersonal behavior in dyadic interactions. *Personality and Social Psychology Bulletin*, *29*, 1082–1090.

McGlynn, R. P., Gibbs, M. E., & Roberts, S. J. (1982). Effects of cooperation versus competitive set and co-action on creative responding. *Journal of Social Psychology*, *188*, 281–282.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, *69*, 220–232.

Milliken, F. J., Bartel, C. A., & Kurtzberg, T. R. (2003). Diversity and creativity in work groups: A dynamic perspective on the affective and cognitive processes that link diversity and performance. In: P. Paulus & B. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 32–62). New York: Oxford University Press.

Moscovici, S. (1976). *Social influence and social change*. London, UK: Academic Press.

Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology*, *12*, 3–24.

Mumford, M. D., Hunter, S. T., Eubanks, D. L., Bedell, K. E., & Murphy, S. T. (2007). Developing leaders for creative efforts: A domain-based approach to leadership development. *Organizational Behavior and Human Decision Processes*, *17*, 402–417.

Mumford, M. D., Scott, G. M., Gaddis, B., & Strange, J. M. (2002). Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly*, *13*, 705–750.

Nemeth, C. J., & Ormiston, M. (2007). Creative idea generation: Harmony versus stimulation. *European Journal of Social Psychology*, *37*, 524–535.

Nemeth, C. J., & Staw, B. S. (1989). The tradeoffs of social control and innovation in small groups and organizations. In: L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 22, pp. 175–210). New York: Academic Press.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. (2006). The illusion of group productivity: A reduction of failures explanation. *European Journal of Social Psychology*, *36*, 31–48.
Nowicki, S., & Manheim, S. (1991). Interpersonal complementarity and time of interaction in female relationships. *Journal of Personality*, *25*, 322–333.
Oldham, G. R., & Cummings, A. (1996). "Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, *39*, 607–634.
O'Reilly, C. A., & Flatt, S. (1989). *Executive team demography; Organizational innovation and firm performance*. Working Paper. School of business, University of California, Berkeley, CA.
Orford, J. (1986). The rules of interpersonal complementarity: Does hostility beget hostility and dominance, submission? *Psychological Review*, *93*, 365–377.
Paolillo, J. G., & Brown, W. B. (1978). How organizational factors affect R&D innovation. *Research Management*, *21*, 12–15.
Paulus, P. B., & Dzindolet, M. T. (1993). Social influence processes in group brainstorming. *Journal of Personality and Social Psychology*, *64*, 575–586.
Paulus, P. B., & Yang, H. C. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes*, *82*, 76–87.
Phillips, K. W., & Loyd, D. L. (2006). When surface and deep-level characteristics collide: The effect on dissenting group members. *Organizational Behavior and Human Decision Process*, *99*, 143–160.
Raina, K. M. (1968). A study into the effect of competition on creativity. *Gifted Child Quarterly*, *12*(4), 217–220.
Redmond, M. R., Mumford, M. D., & Teach, R. (1993). Putting creativity to work: Effects of leader behavior on subordinate creativity. *Organizational and Human Decision Processes*, *55*, 120–151.
Rothenberg, A. (1990). *Creativity and madness*. Baltimore, MD: Johns Hopkins University Press.
Russ, S. W. (1993). *Affect and creativity*. Hillsdale, NJ: Lawrence Erlbaum.
Sadler, P., & Woody, E. (2003). Is who you are who you're talking to? Interpersonal style and complementarity in mixed-sex interaction. *Journal of Personality and Social Psychology*, *84*, 80–96.
Schwarz, N. (2000). Emotion, cognition and decision making. *Cognition and Emotion*, *14*, 433–440.
Shalley, C. E., & Gibson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, *15*, 33–53.
Shapiro, P. J., & Weisberg, R. W. (1999). Creativity and bipolar diathesis: Common behavioral and cognitive components. *Cognition and Emotion*, *13*, 741–762.
Shapiro, P. J., Weisberg, R. W., & Alloy, L. B. (2000, June). *Creativity and bipolarity: Affective patterns predict trait creativity*. Paper presented at the convention of the American Psychological Society, Miami, FL.
Simonton, D. K. (1999). Creativity as blind variation and selective retention: Is the creative process Darwinian? *Psychological Inquiry*, *10*, 309–328.
Staw, B. M., & Barsade, S. G. (1993). Affect and managerial performance: A test of the sadder-but-wiser vs. happier-and smarter hypotheses. *Administrative Science Quarterly*, *38*, 304–331.

Stroebe, W., & Diehl, M. (1994). Why groups are less effective than their members: On productivity loss and idea generation in groups. In: W. Stroebe & M. Diehl (Eds), *European review of social psychology* (Vol. 5, pp. 271–304). Chichester, UK: Wiley.

Sternberg, R. J. (1988a). *The nature of creativity: Contemporary psychological perspectives*. Cambridge: Cambridge University Press.

Sternberg, R. J. (1988b). A three-facet model of creativity. In: R. J. Sternberg (Ed.), *The nature of creativity: Contemporary psychological perspectives* (pp. 125–147). Cambridge: Cambridge University Press.

Strong, S. R., Hills, H. I., Kilmartin, C. T., DeVries, H., Lanier, K., Nelson, B. N., et al. (1988). The dynamic relations among interpersonal behaviors: A test of complementarity and anticomplementarity. *Journal of Personality and Social Psychology*, *54*, 798–810.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry*. New York: Norton.

Sutton, R. I., & Hargadon, A. (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, *41*, 685–718.

Szymanski, K., & Repetto, S. E. (2000, August). *Does negative mood increase creativity*? Paper presented at the convention for the American Psychological Association, Washington, DC.

Tiedens, L. Z., Chow, R. M., & Unzueta, M. M. (2007a). Complementary contrast and assimilation: Interpersonal theory and the social function of contrast and assimilation effects. In: D. Stapel & J. Suls (Eds), *The Social Psychology of Contrast and Assimilation*. New York, NY: Psychology Press.

Tiedens, L. Z., & Fragale, A. R. (2003). Power moves: Complementarity in dominant and submissive nonverbal behavior. *Journal of Personality and Social Psychology*, *84*, 558–568.

Tiedens, L. Z., & Jimenez, M. C. (2003). Assimilation for affiliation and contrast for control: Complementary relationship schemas and complementary self-construals. *Journal of Personality and Social Psychology*, *85*, 1049–1061.

Tiedens, L. Z., Unzueta, M. M., & Young, M. J. (2007b). The desire for hierarchy?: The motivated perception of dominance complementarity in task partners. *Journal of Personality and Social Psychology*, *93*, 402–414.

Torrance, E. P. (1965). *Rewarding creative behavior: Experiments in classroom creativity*. Englewood Cliffs, NJ: Prentice Hall.

Tracey, T. J. (1994). An examination of the complementarity of interpersonal behavior. *Journal of Personality and Social Psychology*, *67*, 864–878.

Tracey, T. J. (2004). Levels of interpersonal complementarity: A simplex representation. *Personality and Social Psychology Bulletin*, *30*(9), 1211–1225.

Tracey, T. J., & Sherry, P. (1993). Complementary interaction over time in successful and less successful supervision. *Professional Psychology: Research and Practice*, *24*, 304–311.

Van de Ven, A. H., & Delbecq, A. L. (1974). The effectiveness of nominal, Delphi, and interacting group decision-making processes. *Academy of Management Journal*, *17*, 605–621.

Vosburg, S. K. (1998). Mood and the quantity and quality of ideas. *Creativity Research Journal*, *11*, 315–324.

Vosburg, S. K., & Kaufmann, G. (1999). In: S. W. Russ (Ed.), *Affect, creative experience, and psychological adjustment* (pp. 19–39). Philadelphia, PA: Brunner/Mazel.

Weber, M. (1946). *From Max Weber: Essays in sociology*. New York: Oxford University Press.

Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology*, *37*, 395–412.

Wiggins, J. S. (1982). Circumplex models of interpersonal behavior in clinical psychology. In: P. C. Kendall & J. N. Butcher (Eds), *Handbook of research methods in clinical psychology* (pp. 183–221). New York: Wiley.

Wiltermuth, S. S., Tiedens, L. Z., & Neale, M. A. (2007). *Benefits of complementarity in negotiations*. Paper presented at Academy of Management Conference, Philadelphia, PA.

Woodman, R. W., Sawyer, J. W., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*, 293–321.

WHEN AND WHY PRIOR TASK EXPERIENCE FOSTERS TEAM CREATIVITY

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ABSTRACT

This chapter presents a theoretical framework for the effects of prior task experience on team creativity. We distinguish among different types of experience within teams, namely direct and indirect prior task experience. We argue that different types of prior task experience differentially influence team creativity, and that the prior experience–creativity relationship is mediated by the development and use of transactive memory systems (TMS). We also argue that team characteristics such as identity and communication moderate the effect of prior task experience on TMS, and task characteristics such as uncertainty and interdependence moderate the effect of TMS on group creativity.

INTRODUCTION

To outperform their competitors in a rapidly changing environment, organizations must continuously gain new knowledge and create novel

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products, processes, and services (De Dreu & West, 2001; Bunderson & Sutcliffe, 2003). That is, organizations need to both *learn* and *be creative* in order to be successful in the marketplace. The concept of learning describes a change in an organization that occurs as a function of experience (Argote, 1999; Levitt & March, 1988), while creativity describes the development of an idea that is novel, useful, and appropriate (Amabile, 1997, 2000). Although many scholars have studied learning and creativity in the last three decades and have made significant contributions in these two research areas, the two literatures have remained relatively disconnected. As a result, little is known about the effect of learning from experience on creativity. Examining the relationship between learning and creativity is extremely important because the processes leading to learning may substantially differ from those leading to creativity (Audia & Goncalo, 2007; Benner & Tushman, 2003) but both are required for long-term organizational survival and success. This suggests that there are potential benefits in integrating research on learning from experience and creativity.

This chapter examines such possibility and investigates the effect of prior task experience on creativity at the team level.[1] We focus on teams because they have increasingly become a basic building block in organizations (Lawler, Mohrman, & Ledford, 1995). Indeed, many organizations rely on teams to carry out both operational and strategic tasks, such as designing and producing new products, delivering services to customers, or developing strategies to respond to changes in the environment. We distinguish among different types of prior task experience within teams. We define task experience within a team as what occurs to a team in the process of performing a certain task. For example, hospital surgical teams gain experience from each procedure they perform. Similarly, consulting teams gain experience from each consulting engagement, as do new product development teams with each product they design. Team experience is comprised of knowledge, as well as motivational and social components (Argote & Todorova, 2007).

Empirical findings on the effect of experience on creativity have been mixed. Several studies have shown that more experience translates into faster execution of creative ideas but also leads to a narrower focus on strategies or practices that have been successful in the past. Consequently, individuals with more experience generate a higher number of ideas as compared to less experienced individuals, but their ideas tend to be incremental (Audia & Goncalo, 2007). Research in the innovation literature suggests a similar pattern. When organizations exploit past knowledge instead of exploring new knowledge domains, they tend to generate incremental rather than radical innovation (Benner & Tushman, 2003; Gupta, Smith, & Shalley, 2006). Other studies, however, suggest the opposite trend and find that prior experience is an essential component of high levels of creativity and radical innovation. Prior experience, indeed, can allow team members to better combine existing knowledge into new ideas. This tends to happen when team members gain experience while working together in the same knowledge domain where they are supposed to innovate (Taylor & Greve, 2006).

Apart from these mixed findings on the effects of prior task experience, there has been little examination of the *type* of experience that influences team creativity. In this chapter, we review theories and research on learning from experience and creativity to develop a theoretical framework for the effect of different types of prior task experience on team creativity. Specifically, we address two central questions: (1) what type of prior task experience is most beneficial for team creativity and (2) which characteristics of both teams and tasks moderate the effect of prior task experience on team creativity.

Our proposed framework helps reconcile the conflicting findings discussed above in two ways. One possible explanation for the mixed findings about the influence of prior experience on creativity might have to do with the type of experience. Teams may learn directly from their own experience, or indirectly from the experience of others (Levitt & March, 1988). While indirect experience is mainly based on explicit knowledge, direct experience also fosters the creation of tacit knowledge that is unique, less transferable, and can lead to new understandings and ideas (Argote, McEvily, & Reagans, 2003; Nonaka & Takeuchi, 1995; Polanyi, 1962). Thus, direct experience may stimulate the development of radically new ideas or products, while indirect experience can lead to more incremental improvements.

We suggest that the development and use of transactive memory systems (TMS) represent the central team processes necessary for group creativity to take place. The development and use of TMS enable team members to effectively share and combine their individual knowledge and ideas and, thus, to generate new ideas as a group. Thus, in our framework, TMS mediates the effect of prior task experience on team creativity.

A second potential explanation for conflicting results on the effects of experience on creativity is related to the boundary conditions under which teams benefit the most from different types of prior experience. We argue that both team and task characteristics can either complement or substitute prior task experience and thus either strengthen or weaken the positive effect of prior task experience on team creativity. Thus, our framework includes moderators for the relationship between prior task experience and the development of TMS at the team level, and for the relationship between TMS and group creativity. Specifically, we suggest that team characteristics such as identity and communication moderate the effect of prior task experience on the development of TMS. As for the TMS-group creativity link, we propose that the relationship is moderated by task characteristics such as uncertainty and interdependence.

The dependent variable of interest in our proposed framework is creativity at the team level. Group creativity may result from the generation of a creative idea by a team member that is directly adopted by the other team members without further modifications. We focus on a different type of group creativity. We view group creativity as the result of collaboration and combination of team inputs (Paulus & Nijstad, 2003). We focus on this type of group creativity because it describes how teams, rather than individuals, generate new ideas and is thus more central to the study of group creativity.

GROUP CREATIVITY

Creativity involves the development of original ideas that are useful and influential (Amabile, 1983; Mayer, 1999). Creativity can be defined as a process as well as an outcome (Ancona & Caldwell, 1992; Dougherty & Hardy, 1996). As an outcome, creativity is defined in terms of various features (Amabile, 1996; Kurtzberg, 1998; Vosberg, 1998), such as fluency (i.e., the number of ideas generated in response to a problem, task, or situation), flexibility (the number of different categories the generated ideas belong to), originality (the novelty of each idea), and usefulness (the practicality of the generated ideas). As a process, creativity is the result of two main types of thinking, divergent and convergent thinking (Nemeth, 1986).

To date, most creativity research has focused on individual creativity, most notably Amabile's (1983, 1996) componential theory of individual creativity. According to her theory, three main components determine individual creativity: task motivation, domain-relevant skills, and creativity-relevant processes. Consistent with this theory, empirical evidence has robustly shown that individuals who possess higher levels of these components tend to be more creative than individuals who possess lower levels of such factors (Conti, Coon, & Amabile, 1996; Ruscio, Whitney, & Amabile, 1998).

In recent years, scholars have started to recognize the need to study creativity at the group level. Creativity is vital to the life and survival of modern organizations in both the public and private sectors, most of which increasingly rely on teams to carry out work. Groups now dominate the makeup of many companies (Lawler et al., 1995). For instance, 50–90% of all U.S. organizations use groups to accomplish organizational activities and goals (Devine, Clayton, Philips, Dunford, & Melner, 1999; Lawler et al., 1995; Gordon, 1992), and more than half of all U.S. employees currently spend at least part of their day working in a group setting (Stewart, Manz, & Sims, 1999). However, despite the central role of groups in the modern organization and the increasing use of teams to foster creativity within firms (Mohrman, Cohen, & Mohrman, 1995; Tesluk, Farr, & Klein, 1997), we still know relatively little about the factors that enhance and inhibit *group* rather than individual creativity (Kasof, 1995; Paulus, Brown, & Ortega, 1999).

The majority of existing research on group creativity has investigated the suboptimality of group performance compared to individual performance on creativity tasks (Sternberg, 1995), showing that groups generate fewer ideas or solutions to problems than the same number of individuals working alone (McGrath, 1984). Studies of group creativity have focused on explaining such suboptimality by examining factors such as social loafing or evaluation apprehension (Karau & Williams, 1993), conformity (Larey & Paulus, 1999), and conditions under which interactions among group members negatively influence creativity (Paulus, Larey, & Dzindolet, 2000). Related research has investigated the influence of various properties of groups (such as diversity and climate) that may contribute to team creativity (see Paulus & Nijstad, 2003).

One potentially important factor that has not received much attention in the creativity literature is the experience team members gain while working together on a task, that is, prior task experience. Different types of *prior task experience* may lead to different levels of team creativity (Gino, Argote, Miron-Spektor, & Todorova, 2009) and it is thus important to distinguish among types of experience team members gain while working together. We focus our discussion on prior task experience, or the experience a team gains with a task.

TYPES OF PRIOR TASK EXPERIENCE

In our work, we distinguish between two types of prior experience relevant to the task a team is facing: direct and indirect (Gino et al., 2009). Both direct and indirect prior task experience have been studied in the past in the learning literature. For example, Levitt and March (1988) suggested that groups as well as organizational units learn in two main ways: directly from their own experience and indirectly from the experiences of others.

This proposition has received strong empirical support. In a study of learning in pizza stores belonging to a franchise, Darr, Argote, and Epple (1995) found that each store learned both from its own experience and from the experience of other stores in the franchise.

The learning literature has also studied a type of learning similar to our concept of direct prior experience, namely learning by doing. Team learning by doing refers to the ability of a team to improve productivity by regularly repeating the same action or behavior. Pisano (1996) examined the concept of learning by doing in product development and demonstrated that it improved productivity. In our own work, we define direct prior task experience as the process through which group members perform the task together as a team, thus gaining experience together in the task at hand or on a similar task (Gino et al., 2009).

The learning literature has also investigated the properties of indirect prior task experience. Within the learning literature, indirect prior task experience is often labeled ‘‘knowledge transfer’’ (e.g., Argote & Ingram, 2000) or ‘‘vicarious learning’’ (Bandura, 1977) because it represents the influence of knowledge acquired by learning from one team to another. For instance, a team might be interested in learning about the strategies, practices, and technologies of other teams or organizations (e.g., Sahal, 1982; Szulanski, 2000). Similarly, in our work, we define indirect prior task experience as the learning that occurs when a group observes another team practice on a similar or related task.

A FRAMEWORK FOR THE IMPACT OF PRIOR TASK EXPERIENCE ON TEAM CREATIVITY

Our proposed model is summarized in Fig. 1. As shown in the figure, we argue that prior task experience at the team level influences team creativity. We suggest that this relationship is explained in part by the development of TMS within the team. We propose that the prior task experience–TMS link is moderated by team characteristics such as communication and identity, while the TMS–creativity link is moderated by task characteristics such as uncertainty and interdependence. We also predict that the moderating effects of team characteristics on the relationship between prior experience and TMS will differ for different types of prior task experience within a team.

In discussing our proposed model, we first introduce the effects of different types of prior task experience on team creativity and describe the

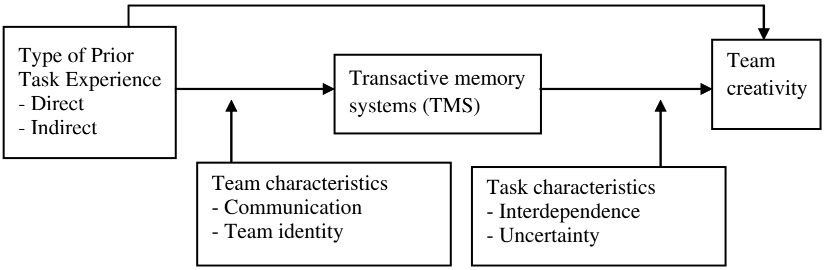

Fig. 1. Learning from Experience and Group Creativity: Theoretical Framework.

mediating role of TMS. Second, we discuss the moderating effects of team characteristics on the relationship between prior task experience and the development of TMS. Finally, we present the moderating factors of the relationship between the use of TMS and group creativity.

Prior Task Experience and Team Creativity

Teams typically have a high level of prior task experience when a new task or problem represents familiar territory for the team or when the task is recognized as a well-developed competency within the team. Task experience can be acquired in different ways: either directly, by working together with other team members on the task (direct prior task experience), or indirectly, by watching another team practice and work on it (indirect prior task experience).

Prior research has suggested that change becomes more difficult as experience or knowledge in a particular domain increases. Levitt and March (1988) refer to this effect as a competency trap, Leonard-Barton (1992) calls it "core rigidity," and Dickson (1992) calls it "routine rigidity." These scholars have suggested that prior task experience in the form of well-developed practices and capabilities can be detrimental to group innovation or group creativity because team members with prior task experience may be locked into old routines and thus be less likely to deviate from well-known practices. This detrimental effect might be even stronger when prior task experience was acquired directly rather than indirectly (by observing another group) because team members gained experience by working together on the task and learning about it.

Although this body of research suggests a negative effect of prior task experience on group creativity, an alternative possibility is that a higher level of prior task experience actually leads to higher levels of group creativity. Prior task experience can stimulate creativity by improving the capacity of each individual to create a product and/or by improving the capacity of the team to share, combine, and use individual contributions to create a collective product. We argue that TMS explains this second type of relationship between prior task experience and team creativity. Research on improvisation as a form of creative behavior suggests that acting extemporaneously without a plan occurs when existing experience and routines are recombined in new ways (Weick, 1993). Other researchers have highlighted the importance of prior knowledge and experience as a source of original solutions and novel activities (Holland, 1975). Prior task experience may channel the ideation process into productive routes and prevent the generation of far-fetched ideas. It can also help in evaluating alternative ideas and selecting the best one to use or recommend (Goldenberg, Mazursky, & Solomon, 1999). Similarly, research by Amabile and her colleagues suggests that expertise is necessary for creativity. Because expertise is acquired through experience, Amabile's work suggests that prior task experience leads to higher levels of creativity compared to no prior task experience. Taken together, these findings suggest that prior task experience, especially when direct, enhances creativity within groups. We thus propose that:

Proposition 1a. Prior task experience leads to higher levels of group creativity.

Proposition 1b. Direct prior task experience leads to higher levels of group creativity as compared to indirect prior task experience.

The Mediating Role of Transactive Memory Systems

As we noted above, we suggest that the development and use of TMS explains part of the relationship between learning from experience and group creativity. The construct of TMS was initially proposed by Wegner (1987), who defined it as the cooperative division of labor for learning, remembering, and communicating team knowledge (e.g., Hollingshead, 1998a, 1998b; Lewis, 2003; Wegner, 1987). Due to this division of labor, a team has a system for distributing and retrieving knowledge based on members' specific areas of expertise (Hinsz, Tindale, & Vollrath, 1997). Thus, in addition to their own knowledge, teams with well-developed TMS have access to the knowledge of other team members.

Research on TMS distinguishes three main dimensions for this construct (Liang, Moreland, & Argote, 1995; Lewis, 2003). The first dimension is *specialization*, which refers to the recognition of distributed expertise within the team (the "knowing who knows what" component). The second dimension of TMS is *credibility*, which refers to team members' beliefs about the reliability of other members' knowledge. When credibility is high within the team, members trust each other's knowledge and build on each other's inputs. Finally, the third dimension of TMS is c*oordination*, which refers to the ability of team members to combine their activities effectively. Coordination requires verbal and nonverbal exchange of information (Hollingshead, 1998b). When team members share the same language and mental models, they can better describe, explain, and predict the behavior of their teammates and effectively perform their task (Mathieu, Heffner, Goodwin, Salas & Cannon-Bowers, 2000).

We suggest that having the opportunity to directly experience a task will stimulate the development of TMS in teams because members within the team have the opportunity to gain expertise on the task as well as knowledge about who is good at which aspect of the task (McGrath & Argote, 2001). TMS development requires the effective sharing of expertise-related information within the team (Lewis, 2003). In teams with direct prior task experience, team members' ability and willingness to actively share their expertise with other team members will be enhanced. The deeper understanding of the task as well as the shared language and mental models developed while working on the task will foster the development of TMS.

Direct experience gives people deep experience with a task, thus allowing them to better understand the task. This knowledge enhances team members' ability to quickly specialize and contribute to new tasks in useful ways. Having deeper experience with the task helps team members divide cognitive labor and make better assignments to specialized knowledge roles. When working together on the same task, team members are likely to develop knowledge about the other team members as well as a shared language, or a task-related jargon, that allows them to communicate their expertise more effectively and conveys tacit knowledge that is unique to the team (Weber & Camerer, 2003). Shared language and knowledge about the task will allow members to recognize their expertise and confidently share information about it and about the task with others. Such knowledge and information sharing will also increase members' ability to clearly direct information to appropriate team members and enhance their teammates' ability to coordinate with one another. Thus, prior task experience will enable team members to develop TMS by promoting deep task understanding, shared language, and knowledge of who knows what. Direct prior task experience, as compared to indirect prior task experience, will enable team members to benefit more from the development of a deeper understanding of the task, a better ability to specialize, and more developed shared language. Therefore, we propose:

Proposition 2a. Prior task experience positively influences TMS.

Proposition 2b. Direct prior task experience leads to stronger TMS than indirect prior task experience.

Prior research on groups has robustly demonstrated a link between TMS and team performance (e.g., Austin, 2003; Lewis, 2003; Liang et al., 1995). Building on this body of work, we argue that TMS represents the cognitive mechanism through which direct prior task experience influences group creativity (Gino et al., 2009). Developing TMS will help team members correctly identify where the expertise reside within the team. Suck knowledge, in turn, will help team members specialize and delegate tasks based on members' expertise.

Assignment based on specialization allows each member to attend to relevant information and encode it in memory, thus freeing up each members to concentrate on their assignments. This improvement in information processing might result in higher levels of creativity within the team, since members do not need to waste cognitive resources by encoding information relevant to subtasks to which other members are assigned. Knowledge of who knows and does what may also help create new products by enabling team members to combine members' expertise in new ways.

Credibility, the second component of TMS, is also likely to enhance team creativity. When members trust each other's knowledge, they can build on each other's inputs. Building on each other's input may lead to "collective creativity," or creative insights resulting from interactions among team members that are more than the sum of individual creative contributions (Hargadon & Bechky, 2006). Finally, coordination, the third component of TMS, is likely to ease interactions and understanding among team members and reduce possible conflicts that were found to hinder creativity (Lovelace, Shapiro, & Weingart, 2001). Therefore, we propose:

Proposition 3. The development and use of TMS positively influence team creativity.

As suggested earlier, through the development of TMS, team members share, coordinate, and efficiently encode information gathered through direct prior task experience. This deep understanding of specific aspects of a task and team members' abilities is an important antecedent of team creativity, given the impact of each member's expertise on creative behavior (Amabile, 2000; Rietzschel, Nijstad, & Stroebe, 2007). This reasoning leads us to the following proposition:

> **Proposition 4.** The development and use of TMS mediate the relationship between direct prior task experience and team creativity.

The Moderating Effects of Team Characteristics

Our theoretical framework (depicted in Fig. 1) draws on the input–process–output framework of work in groups (or I–P–O model, see Steiner, 1972; McGrath, 1984; Ilgen, Hollenbeck, Johnson, & Jundt, 2005). According to this classic framework, the nature of team performance is expressed in terms of a system in which inputs lead to processes that in turn lead to outcomes. We extend this framework by introducing moderators in the relationship between prior task experience (input) and group creativity (outcome). We focus on two main sets of moderators, namely task characteristics and team characteristics, because the features of the task a team is asked to perform and the features of the team itself are the main characteristics defining the team context.

There are obviously many characteristics of teams that might affect the relationship between prior task experience and TMS. Drawing on theories and prior research on learning, creativity, and TMS, we focus on communication and identity as the most relevant team characteristics for our framework. We predict differential effects of these team characteristics on the relationship between prior task experience and the development of TMS. We make different predictions about the moderating effect of communication on TMS: when teams learn from direct experience, communication can interfere with the development of TMS. Conversely, when teams learn from indirect experience, communication complements the development of TMS. Finally, we make different predictions about the effects of identity. In teams with direct prior task experience, identity is beneficial, while in teams with indirect prior task experience, identity might be detrimental for the development of TMS.

Communication

Communication allows for the sharing of information and ideas. Research in management and organization science shows that team members must have a high level of interpersonal communication to succeed in interdependent and uncertain tasks (e.g., Pelz & Andrews, 1966; Thompson, 1967; Van de Ven, Delbecq, & Koenig, 1976). Communication may, however, interfere with the development of implicit coordination mechanisms and tacit knowledge during learning from direct experience, and thus may reduce the benefits of direct prior task experience. In a laboratory experiment, Hollingshead (1998b) examined the impact of communication during learning on collective recall. She showed that dating couples recalled more words than a couple of strangers when they did not communicate during the process of learning the words. She argued that communication detracted from the implicit interaction systems that couples had developed during their common experiences, disrupting the implicit procedures of their interactions and division of responsibilities. Strangers, on the other hand, recalled more words when they communicated during learning. They needed to exchange information in order to better understand who knows what and to divide responsibilities. Thus, communication affected the way knowledge was learned and encoded in TMS.

Similarly, in teams with direct prior task experience, communication might interfere in the process of developing TMS. As team members interact to perform a task, they develop shared task mental models that lead to the development of implicit coordination mechanisms (Wittenbaum, Vaughan, & Stasser, 1998). Shared task mental models increase implicit coordination and reduce the need for coordination through communication (Espinosa, Lerch, & Kraut, 2004; Rico, Sánchez-Manzanares, Gil, & Gibson, 2008). Moreover, communication can reduce the use of implicit coordination mechanisms and interfere with assigning roles to team members according to their expertise. Therefore, we suggest that communication can harm the development of TMS in teams with direct prior task experience.

In contrast, teams that learn from the experience of others need to communicate in order to adapt this experience to their context. The greater the difference between the context of the observing team and the context of the observed team, the greater the need is to adapt the new knowledge acquired by observing others (Argote, 1999). Bresman (forthcoming) found that learning from indirect experience does not improve performance in teams where the indirect experience is applied without further elaboration. Thus, communication allows for the development of stronger TMS in teams engaged in learning from indirect experience.

We propose that team members with direct prior task experience working together may be less able to develop TMS when they communicate. On the other hand, like strangers, team members with indirect prior task experience working together may develop better TMS when they communicate. Thus, we propose:

Proposition 5a. The positive effect of direct prior task experience on TMS is attenuated as communication increases within teams.

Proposition 5b. The positive effect of indirect prior task experience on TMS is enhanced as communication increases within teams.

Team Identity

Social identity has been defined as the extent to which group members share a self-conception that specifies features of a self-inclusive social category that causes them to identify themselves with the group (Tajfel, 1978; Tajfel & Turner, 1986). Social identity is expected to have a critical impact on team creativity due to its influence on the integration of diverse perspectives. Normally, such integration is difficult to achieve in team or group settings because differences between people on a number of dimensions (e.g., gender or ethnicity) lead them to hold biases and stereotypes toward one another (Van Knippenberg & Ellemers, 2003). To a large extent, these biases and stereotypes arise from our deeply rooted functional identities (Ashforth & Mael, 1989; Tajfel, 1982). Unless these identities are replaced by a sense of team identity, it may be difficult for team members to discover critical, novel linkages among diverse perspectives. Social identity research suggests that the adverse effect of individual identities can be mitigated if team members overcome group biases and stereotypes against one another and develop a strong sense of team identity (Brewer & Miller, 1984; Sethi, 2000).

From a cognitive perspective, in a team with a strong identity, this process occurs as individual boundaries become subsumed by an inclusive, team-based boundary in the minds of members that reduces the adverse effect of functional identities and orientations (Brewer & Miller, 1984). A strong identity enhances the perception of similarities among members and leads to psychological acceptance of other group members and their work methods, thereby reducing the adverse effects of biases and stereotypes (Ashforth & Mael, 1989; Sherif & Sherif, 1969). In other words, team members can develop a feeling of psychological ownership of their project that enhances cooperative behaviors and motivation (Pierce, Rubenfeld & Morgan, 1991). Consistent with this view, Kane, Argote, and Levine (2005) found that team members are more likely to learn from members who share their social identity than from members who do not share their social identity.

By contrast, a weak team identity will be characterized by retention of individual identities, biases, and stereotypes that can lead members to overlook or reject the information and perspectives of other members (Maltz & Kohli, 1996). Consequently, team members will be unable to effectively integrate the information and perspectives that different members bring to the table (Jaworski & Kohli, 1993; Slater & Narver, 1995). As such, teams with a weak identity are less likely to discover complex and novel linkages among the different pockets of knowledge and expertise possessed by individual group members. Therefore, we propose:

Proposition 6a. The positive effect of direct prior task experience on TMS is enhanced as social identity increases within teams.

When teams learn from other teams, social identity can actually hinder the use of the experience of others. High social identity may lead to intergroup competition and in-group favoritism (Fein & Spencer, 1997; Tajfel, 1978). Team members who have a strong identity will be motivated to view their own experience as valuable and to reject the experience of other groups. Moreover, high social identity may increase the effect of the "not invented here" syndrome discussed in the knowledge transfer literature (Katz & Allen, 1982). The social identity may lead to the rejection of the knowledge of other teams and thus reduce knowledge transfer (Argote, 1999). In an experiment, Kane et al. (2005) showed that the teams did not take into consideration the knowledge of newcomers with a different social identity. Consistent with these findings and reasoning, we suggest that social identity moderates the effect of indirect prior task experience on the development and use of TMS within teams. Specifically, we propose:

Proposition 6b. The positive effect of indirect prior task experience on TMS is attenuated as social identity increases within teams.

The Moderating Role of Task Characteristics

The creativity process is influenced not only by features of the team, but also by the specific characteristics of the task the team is facing. Indeed, task characteristics are related to the knowledge members possess regarding what is required to perform well on a certain task and the degree to which they are able to combine the knowledge and information of each member (Gladstein, 1984). Prior theoretical work on task design has proposed that two characteristics are particularly relevant: task interdependence and task uncertainty (Lindley, Brass, & Thomas, 1995; Saavendra, Earley, & Van Dyne, 1993). We thus focus on these two features as potential moderators of the relationship between TMS and group creativity.

Task Interdependence

A structural feature of the task, task interdependence, determines the nature of the instrumental relations that exist between team members. When a task is interdependent, team members must share or exchange information, materials, or expertise in order to achieve the desired output or performance (Cummings, 1978). As a task becomes more complex and members require each other's assistance and information to perform the job, task interdependence increases (Wageman, 1995). When tasks are interdependent, the need for a smooth interaction among team members increases due to a higher demand for communication, coordination, and cooperation within the group (Thibaut & Kelley, 1959; Salanick & Pfeffer, 1977; Saavendra et al., 1993). Thus, when task interdependence is high, teams benefit more from TMS than when interdependence is low. When task interdependence is low, the need for the effective cognitive division of labor, collaboration in combining inputs, and smooth coordination is reduced, as is the need to share knowledge about what is required for task completion (Wageman, 1995). The beneficial effects of TMS on creativity are thus likely to increase as task interdependence increases because team members have a deep knowledge and understanding of the specific requirements of the task. We thus propose that:

Proposition 7. The positive effect of TMS on team creativity is enhanced as task interdependence increases within teams.

Task Uncertainty

In their task-uncertainty framework, Gist and Mitchell (1992) define task uncertainty based on the level of knowledge concerning the link between performing task strategies or practices and obtaining the desired outcome. When task uncertainty is low, team members know that if they carry out certain strategies, they will achieve the desired outcome. When task uncertainty is high, team members do not possess this knowledge.

Applying these ideas to our framework, when group members are not confident that certain practices will improve team creativity, they will need to seek advice from other team members. Knowing which member knows what becomes especially beneficial when team members need advice from other members about how to approach an uncertain task. Teams with TMS that face such tasks may be more likely to use each member's expertise successfully to generate creative solutions and ideas. But when task uncertainty is low, team members will be more confident about how to use their prior task experience to generate new ideas, and thus may not need as much interaction with other team members. When the task is not inherently uncertain, the likelihood of actually achieving high levels of group creativity on the task depends less on the use of TMS. In support of this prediction, using an empirically grounded simulation, Ren, Carley, and Argote (2006) showed that TMS was more beneficial to groups in volatile environments than to groups in stable environments. Therefore, we propose:

Proposition 8. The positive effects of TMS on team creativity are enhanced as task uncertainty increases within teams.

DISCUSSION AND DIRECTIONS FOR FUTURE RESEARCH

Teams are an increasingly significant work unit in modern organizations, and, as such, they are also integral to the development of innovative products and services. Nonetheless, most research on creativity thus far has focused on the individual level (Agrell & Gustafson, 1996; Kurzberg & Amabile, 2001). Investigating the effect of prior task experience on creativity at the individual level fails to fully capture the creativity phenomenon at the team level, in that creativity is not restricted to a burst of individual inventive thinking (Agrell & Gustafson, 1996; West & Wallace, 1991). In this chapter, we investigate the influence of prior task experience on creativity at the team level and contribute to both the team creativity and the team learning literatures.

We suggested that one important factor that influences group creativity is the level of experience on the task that a team acquired prior to working on the task. We distinguished between two different types of prior task experience, namely indirect and direct prior task experience. Our framework also includes TMS as a mediator in the relationship between prior task experience and group creativity. We argued that the development and use of TMS allows for the optimal use and combination of individual inputs in the group idea generation process. Thus, it represents the main mechanism through which learning from prior task experience affects team creativity. By focusing on the role of TMS in explaining the relationship between prior task experience and team creativity, our theoretical framework departs from prior research which mainly focused on TMS and convergent outcomes and examines instead TMS and *divergent* outcomes such as creativity.

We also elaborated on task and team characteristics that moderate the relationship between prior experience and TMS and the relationship between TMS and creativity. As we argued, the relationship between prior task experience and TMS may be moderated by team communication and shared identity. We proposed that communication and identity have different effects on the relationship between prior task experience and creativity depending on the type of prior task experience considered. Thus, our proposed framework and propositions help reconcile existing findings on the effect of experience on creativity. Indeed, one possible explanation for the mixed findings on the effects of experience on creativity concerns the type of prior experience. As mentioned earlier, teams may learn directly from their own experience or indirectly from the experience of others (Argote & Todorova, 2007). Direct experience fosters the creation of tacit knowledge that is unique, less transferable, and that can lead to new understandings and ideas (Argote et al., 2003). Thus, direct experience may stimulate the development of radically new products, while indirect experience can lead to more incremental improvements. Our theoretical framework is consistent with this explanation. Offering another way to reconcile mixed evidence from prior research on experience and creativity, we theorize on the moderating effects of task interdependence and uncertainty on the relationship between TMS and team creativity.

The framework presented in this chapter offers several ideas and testable propositions for future research. Future research is warranted to examine the validity of our framework using both experimental and field methods. In addition, future research could explore how teams gain experience and individuals experience interacts with team experience. In our framework, we assumed that teams gain prior task experience together. But in contemporary organizations, teams are often formed on a project basis and must work on creative tasks without previous experience working together. In this case, team members come together to work on a task but have no experience relevant to its completion. This happens quite often in settings such as project management in both the software and film industries, where teams are assembled to deal with new tasks on a regular basis.

Another important direction for future research is the study of the ongoing relationship between prior task experience and team creativity. Over time, the effects depicted in Fig. 1 may change.[2] It could be that team members need to reach a certain level of familiarity and comfort with a task before they are able to look at it through a creativity and innovation lens. When a team first approaches a task, members may concentrate their efforts on understanding the features of the task and the knowledge required to perform well on it. Once they have reached a certain level of familiarity and comfort, team members may be better equipped to generate new ideas and solutions that will increase group creativity. Prior task experience, especially when acquired directly, may help team members speed up through the initial phase of gaining familiarity and comfort with task execution. By contrast, lack of prior experience on the task will render the first phase particularly important for the team and is likely to slow down the creativity process. Yet it is also possible that, over time, the positive effect of prior task experience on team creativity will be attenuated. For instance, successful experience in performing a task was found to enhance the number of generated ideas but hinder their radicalness (Audia & Goncalo, 2007). However, after working together for long periods, teams, like individuals, may limit their search scope to proven solutions and familiar routes, ending up with incremental rather than radical innovation. Alternatively, team members lacking direct experience in a training phase may not catch up with those having direct experience. Research has shown that when presented with a task, team members focus their efforts on performing and do not invest in developing the task strategies that may improve their long-term performance (Hackman, Brousseau, & Weiss, 1976). According to logic, team members in the indirect experience condition would focus on performing and not develop the sort of specialized knowledge structures or TMS that would benefit their performance in the long run. Future research investigating how time affects the relationship between prior task experience and group creativity is needed. Such research may identify important insights on the boundary conditions of the influence of prior task experience on team creativity.

Our propositions may have important practical implications. Over the past decade, an increasing number of U.S. companies have transferred production and jobs abroad, with the goal of importing products and services back into the United States. This phenomenon, known as offshoring, has been driven primarily by firms' desire to reduce labor costs. Our propositions suggest that this practice may have hidden costs. The benefits of cost reduction may indeed be outweighed by a loss in the ability to innovate.

CONCLUSIONS

Our goal in this chapter was to propose a theoretical framework for the effects of different types of prior task experience on creativity at the group level. With this framework, the chapter integrates literatures on learning from experience and creativity. It also extends current understanding of (1) the effects of types of prior task experience (direct vs. indirect experience) on team creativity and (2) the team and task characteristics that can change whether and how much teams facing creativity tasks will benefit from direct and indirect prior task experience. We believe that our theoretical framework addresses prior inconsistent findings concerning the effects of team experience on team creativity while also providing interesting ideas for future research. We hope that our framework stimulates empirical research on the important question of how and when experience affects creativity.

NOTES

1. Some research in the management literature uses the labels "teams" and "groups" interchangeably; other research differentiates between the two terms. The term "group" has a more general meaning than the term "team" and does not necessitate the presence of an organizational setting. In this chapter, we use the terms "team creativity" and "group creativity" interchangeably because this terminology does not affect our proposed model.
2. We thank Gregory Northcraft for suggesting this interesting avenue for future research.

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REFERENCES

Agrell, A., & Gustafson, R. (1996). Innovation and creativity in work groups. In: M. A. West (Ed.), *Handbook of work group psychology* (pp. 317–343). Chichester: Wiley.

Amabile, T. M. (1983). *The social psychology of creativity*. New York: Springer-Verlag.

Amabile, T. M. (1996). *Creativity in context: Update to the social psychology of creativity*. Boulder, CO: Westview Press.

Amabile, T. M. (1997). Motivating creativity in organizations: On doing what you love and loving what you do. *California Management Review*, *40*(1), 1–39.

Amabile, T. M. (2000). Stimulate creativity by fueling passion. In: E. Locke (Ed.), *Handbook of principles of organizational behavior* (pp. 331–341). Malden, MA: Blackwell.

Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization Science*, *3*(3), 231–241.

Argote, L. (1999). *Organizational learning: Creating, retaining and transfusing knowledge*. Norwell, MA: Kluwer.

Argote, L., & Ingram, P. (2000). Knowledge transfer: A basis for competitive advantage in firms. *Organizational Behavior and Human Decision Processes*, *82*(1), 150–169.

Argote, L., McEvily, B., & Reagans, R. (2003). Introduction to the special issue of managing knowledge in organizations: Creating, retaining, and transferring knowledge. *Management Science*, *43*(4).

Argote, L., & Todorova, G. (2007). Organizational learning. *International Review of Industrial and Organizational Psychology*, *22*, 193–234.

Ashforth, B. E., & Mael, F. (1989). Social identity theory and the organization. *Academy of Management Review*, *14*, 20–39.

Audia, P. G., & Goncalo, J. A. (2007). Past success and creativity over time: A study of inventors in the hard disk drive industry. *Management Science*, *52*(1), 1–15.

Austin, J. R. (2003). Transactive memory in organizational groups: The effects of content, consensus, specialization and accuracy on group performance. *Journal of Applied Psychology*, *88*(5), 866–878.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Benner, M. J., & Tushman, M. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, *28*(2), 238–356.

Bresman, H. (forthcoming). External learning activities and team performance: A multi-method field study. *Organization Science*.

Brewer, M. B., & Miller, N. (1984). Beyond the contact hypothesis: Theoretical perspectives on segregation. In: N. Miller & M. B. Brewer (Eds), *Groups in contact: The psychology of desegregation* (pp. 281–302). Orlando, FL: Academic Press.

Bunderson, J. S., & Sutcliffe, K. M. (2003). Management team learning orientation and business unit performance. *Journal of Applied Psychology*, *88*(3), 552–560.

Conti, R., Coon, H., & Amabile, T. M. (1996). Evidence to support the componential model of creativity: Secondary analyses of three studies. *Creativity Research Journal*, *9*(4), 385–389.

Cummings, T. G. (1978). Self-regulating work groups: A socio-technical synthesis. *Academy of Management Review*, *3*, 625–634.

Darr, E. P., Argote, L., & Epple, D. (1995). The acquisition, transfer and depreciation of knowledge in service organizations: Productivity in franchises. *Management Science*, *41*(11), 1750–1762.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*(6), 1191–1201.

Devine, D. J., Clayton, L. D., Philips, J. L., Dunford, B. B., & Melner, S. B. (1999). Teams in organizations: Prevalence, characteristics, and effectiveness. *Small Group Research*, *30*, 678–711.

Dickson, P. R. (1992). Toward a general theory of competitive rationality. *Journal of Marketing*, *56*, 69–83.

Dougherty, D. J., & Hardy, C. (1996). Sustained product innovation in large, mature organizations: Overcoming innovation-to-organization problems. *Academy of Management Journal*, *39*(5), 1120–1153.

Espinosa, A., Lerch, F. J., & Kraut, R. E. (2004). Explicit vs. implicit coordination mechanisms and task dependencies: One size does not fit all. In: E. Salas & S. M. Fiore (Eds), *Team cognition: Process and performance at the inter- and intra-individual level* (Ch. 6, pp. 107–129). Washington, DC: American Psychological Association.

Fein, S., & Spencer, S. J. (1997). Prejudice as self-image maintenance: Affirming the self through derogating others. *Journal of Personality and Social Psychology*, *73*, 31–44.

Gino, F., Argote, L., Miron-Spektor, E., & Todorova, G. (2009). First, get your feet wet: The effects of learning from direct and indirect experience on team creativity. Working paper.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, *17*, 183–211.

Gladstein, D. L. (1984). A model of task group effectiveness. *Administrative Science Quarterly*, *29*, 499–517.

Goldenberg, J., Mazursky, D., & Solomon, S. (1999). Toward identifying the inventive templates of new products: A channeled ideation approach. *Journal of Marketing Research*, *36*(2).

Gordon, J. (1992). Work teams: How far have they come? *Training*, *29*(10), 59–62.

Gupta, A. K., Smith, K. G., & Shalley, C. E. (2006). The interplay between exploration and exploitation. *Academy of Management Journal*, *49*(4), 693–706.

Hackman, J. H., Brousseau, K. R., & Weiss, J. A. (1976). The interaction of task design and group performance strategies in determining group effectiveness. *Organizational Behavior and Human Decision Processes*, *16*, 350–365.

Hargadon, A. B., & Bechky, B. A. (2006). When collections of creatives become creative collectives: A field study of problem solving at work. *Organization Science*, *17*, 484–500.

Hinsz, V. B., Tindale, R. S., & Vollrath, D. A. (1997). The emerging conceptualization of groups as information processors. *Psychological Bulletin*, *121*, 43–64.

Holland, J. H. (1975). *Adaptation in natural and artificial systems: An introductory analysis with applications to biology, control and artificial intelligence*. Ann Arbor, MI: University of Michigan Press.

Hollingshead, A. B. (1998a). Retrieval processes in transactive memory systems. *Journal of Personality and Social Psychology*, *74*(3), 659–671.

Hollingshead, A. B. (1998b). Communication, learning, and retrieval in transactive memory systems. *Journal of Experimental Social Psychology*, *43*, 423–442.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input–process–output models to IMOI models. *Annual Review Psychology*, *56*, 517–543.

Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing*, *57*(July), 53–70.

Kane, A. A., Argote, L., & Levine, J. M. (2005). Knowledge transfer between groups via personal rotation: Effects of social identity and knowledge quality. *Organizational Behavior and Human Decision Processes*, *96*, 56–71.

Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, *65*, 681–706.

Kasof, J. (1995). Explaining creativity: The attributional perspective. *Creativity Research Journal*, *8*, 311–366.

Katz, R., & Allen, T. J. (1982). Investigating the not invented here NIH syndrome: A look at the performance, tenure, and communication patterns of 50 R&D project groups. *R&D Management*, *121*, 7–19.

Kurtzberg, T. (1998). Creative thinking, cognitive aptitude, and integrative joint gain: A study of negotiator creativity. *Creativity Research Journal*, *11*, 283–293.

Kurzberg, T. R., & Amabile, T. M. (2001). From Guilford to creative synergy: Opening the black box of team-level creativity. *Creativity Research Journal*, *13*, 284–285.

Larey, T. S., & Paulus, P. B. (1999). Group preference and convergent tendencies in small groups: A content analysis of group brainstorming performance. *Creativity Research Journal*, *12*, 175–184.

Lawler, E. E., Mohrman, S. A., & Ledford, G. E. (1995). *Creating high performance organizations: Practices and results of employee involvement and total quality management in Fortune 1000 companies*. San Francisco, CA: Jossey-Bass.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, *13*, 111–125.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Review of Sociology*, *14*, 319–340.

Lewis, K. (2003). Measuring transactive memory systems in the field: Scale development and validation. *Journal of Applied Psychology*, *88*(4), 587–604.

Liang, D. W., Moreland, R., & Argote, L. (1995). Group versus individual training and group performance: The mediating role of transactive memory. *Personality and Social Psychology Bulletin*, *21*(4), 384–393.

Lindley, D. H., Brass, D. J., & Thomas, J. B. (1995). Efficacy-performance spirals: A multilevel perspective. *Academy of Management Review*, *20*, 645–676.

Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communication perspective. *Academy of Management Journal*, *44*(4), 779–793.

Maltz, E., & Kohli, A. K. (1996). Market intelligence dissemination across functional boundaries. *Journal of Marketing Research*, *33*, 47–61. Mayer, 1999.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, *85*(2), 273–283.

Mayer, R. E. (1999). Fifty years of creativity research. In: R. J. Sternberg (1999). *Handbook of creativity*. Cambridge, UK: Cambridge University Press.

McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.

McGrath. J. E., & Argote, L. (2001). Group processes in organizational contexts. In: M. A. Hogg & R. S. Tindale (Eds), *Blackwell handbook of social psychology: Group processes* (Vol. 3, 603–627). Oxford, UK: Blackwell.

Mohrman, S. A. M., Cohen, S. G., & Mohrman, A. M. (1995). *Designing team based organizations*. New York: Jossey-Bass.

Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychology Reports*, 23–32.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company*. New York: Oxford University Press.

Paulus, P. B., Brown, V., & Ortega, A. H. (1999). Group creativity. In: R. E. Purser & A. Montuori (Eds), *Social creativity* (Vol. 2, pp. 151–176). Cresskill, NJ: Hampton.

Paulus, P. B., Larey, T. S., & Dzindolet, M. T. (2000). Creativity in groups and teams. In: M. Turner (Ed.), *Groups at work: Advances in theory and performance* (pp. 319–338). Hillsdale, NJ: Erlbaum.

Paulus, P. B., & Nijstad, B. A. (2003). *Group creativity: Innovation through collaboration*. New York: Oxford University Press.

Pelz, D., & Andrews, F. (Eds). (1966). *Scientists in organizations: Productive climates for research and development*. New York: Wiley.

Pierce, J. L., Rubenfeld, S. A., & Morgan, S. (1991). Employee ownership: A conceptual model of process and effects. *Academy of Management Review*, *16*(1), 121–144.

Pisano, G. P. (1996). *The development factory: Unlocking the potential of process innovation*. Boston, MA: Harvard Business School Press.

Polanyi, M. (1962). *Personal knowledge: Towards a post-critical philosophy*. London: Routledge and Kegan Paul.

Ren, Y. Q., Carley, K. M., & Argote, L. (2006). The contingent effects of transactive memory: When is it more beneficial to know what others know? *Management Science*, *52*, 671–682.

Rico, R., Sánchez-Manzanares, M., Gil, F., & Gibson, C. (2008). Team implicit coordination processes: A team knowledge based approach. *Academy of Management Review*, *23*(1), 163–184.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2007). Relative accessibility of domain knowledge and creativity: The effects of knowledge activation on the quantity and quality of ideas. *Journal of Experimental Social Psychology*, *43*, 933–946.

Ruscio, J., Whitney, D. M., & Amabile, T. M. (1998). The fishbowl of creativity. *Creativity Research Journal*, *11*, 243–263.

Saavendra, R., Earley, P. C., & Van Dyne, L. (1993). Complex interdependence in task-performing groups. *Journal of Applied Psychology*, *78*, 61–72.

Sahal, D. (1982). Alternative conceptions of technology. *Research Policy*, *10*, 2–24.

Salanick, G. R., & Pfeffer, J. (1977). An examination of need satisfaction models of job attitudes. *Administrative Science Quarterly*, *22*, 427–456.

Sethi, R. (2000). Stability of equilibria in games with procedurally rational players. *Games and Economic Behavior*, *32*, 85–104.

Sherif, M., & Sherif, C. W. (Eds). (1969). *Interdisciplinary relationships in the social sciences*. Chicago, IL: Aldine.

Slater, S. F., & Narver, J. (1995). Market orientation and the learning organization. *Journal of Marketing*, *59*(3), 63–74.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.

Sternberg, R. J. (1995). *Defying the crowd: Cultivating creativity in a culture of conformity*. New York: Free Press.

Stewart, G. L., Manz, C. C., & Sims, H. P. (1999). *Team work and group dynamics*. New York: Wiley.

Szulanski, G. (2000). The process of knowledge transfer: A diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes*, *82*, 9–27.

Tajfel, H. (1978). Social categorization, social identity and social comparison. In: H. Tajfel (Ed.), *Differentiation between social groups: Studies in the social psychology of intergroup relations* (pp. 61–76). London: Academic Press.

Tajfel, H. (1982). *Social identity and intergroup relations*. Cambridge: Cambridge University Press.

Tajfel, H., & Turner, J. C. (1986). Social identity theory of intergroup behavior. In: S. Worchel & W. G. Austin (Eds), *Psychology of intergroup relations* (2nd ed., pp. 7–24). Chicago, IL: Nelson Hall.

Taylor, A., & Greve, H. R. (2006). Superman or the fantastic four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, *49*(4), 723–740.

Tesluk, P. E., Farr, J. L., & Klein, S. R. (1997). Influences of organizational culture and climate on individual creativity. *Journal of Creative Behavior*, *31*, 27–41.

Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. New York: Wiley.

Thompson, J. (1967). *Organizations in action*. New York: McGraw-Hill.

Van de Ven, A. H., Delbecq, A., & Koenig, R. (1976). Determinants of coordination modes within organizations. *American Sociological Review*, *41*, 322–328.

Van Knippenberg, D., & Ellemers, N. (2003). Social identity and group performance: Identification as the key to group-oriented efforts. In: S. A. Haslam, D. van Knippenberg, M. J. Platow & N. Ellemers (Eds), *Social identity at work: Developing theory for organizational practice* (pp. 29–42). New York: Psychology Press.

Vosberg, S. K. (1998). The effect of positive and negative mood on divergent-thinking performance. *Creativity Research Journal*, *2*, 165–172.

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly*, *40*, 145–180.

Weber, R. A., & Camerer, C. F. (2003). Cultural conflict and merger failure: An experimental approach. *Management Science*, *49*(4), 400–415.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of group mind. In: B. Mullen & G. R. Goethals (Eds), *Theories of group behavior*. New York: Springer-Verlag.

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, *38*, 628–652.

West, M. A., & Wallace, M. (1991). Innovation in the health care teams. *European Journal of social psychology*, *21*(4), 303–315.

Wittenbaum, G. M., Vaughan, S. I., & Stasser, G. (1998). Coordination in task-performing groups. In: R. S. Tindale, J. Edwards & E. J. Posavac, et al. (Eds), *Social psychological applications to social issues: Applications of theory and research on groups* (pp. 177–204). New York: Plenum Press.

STIMULATING CREATIVITY IN GROUPS THROUGH MENTAL SIMULATION

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ABSTRACT

A growing literature has recognized the importance of mental simulation (e.g., imagining alternatives to reality) in sparking creativity. In this chapter, we examine how counterfactual thinking, or imagining alternatives to past outcomes, affects group creativity. We explore these effects by articulating a model that considers the influence of counterfactual thinking on both the cognitive and social processes known to impact group creative performance. With this framework, we aim to stimulate research on group creativity from a counterfactual perspective.

As individuals increasingly work in groups (Guzzo, 1996), and organizations are driven by the need to innovate (Cummings & Oldham, 1997), researchers across a number of disciplines have sought to better understand group creativity. Creativity is typically defined as ideas that are novel and useful (Amabile, 1983), and a growing literature has recognized the importance of mental simulation (e.g., imagining alternatives to reality) in

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sparking creativity. In this chapter, we seek to examine the impact of one form of mental simulation on creativity: counterfactual thinking. Counterfactual thinking occurs whenever people consider alternatives to past events or consider what almost was; thoughts of "if only" and "what if" are signposts for counterfactual musings. For example, a student who does poorly on a test might consider, "If only I had studied more, I would have done better on the test."

Counterfactual thinking is already known to impact individual-level performance on both creative association tasks (Kray, Galinsky, & Wong, 2006) and creative idea generation tasks (Markman, Lindberg, Kray, & Galinsky, 2007), yet less is known about the influence of counterfactuals on group creativity. To address this gap, we propose that counterfactual thinking affects group creativity through its effects on a number of cognitive and social group processes. Specifically, we propose that counterfactuals influence creativity through its effects on cognitive antecedents of creativity, such as divergent thinking and analogical reasoning. We also explore how counterfactuals influence social processes that are known to impact creative output, such as information sharing, coordination, and motivation. Through this examination, we develop a model that illustrates the impact of counterfactual thinking on both cognitive and social processes relevant to group creative performance.

The purpose of this chapter is to articulate a model linking counterfactual thought and group creativity, and to develop a research agenda that will both further our understanding of this relationship and provide practical implications for organizations that desire to maintain a competitive advantage through innovation. In the following sections, we first define group creativity. Next, we discuss the dimensions of counterfactual thinking. We then turn our attention to the ways in which counterfactual thinking may impact group-level cognitive and social creative processes. We conclude with a summary and discussion of future research directions.

DEFINING GROUP CREATIVITY

Creativity can be parsimoniously defined as ideas that are novel and useful (e.g., Amabile, 1983; Amabile, Conti, Coon, Lazenby, & Herron, 1996). Because groups are defined as two or more individuals who are interdependent and work together to achieve a common goal, we view group creativity as individuals working collaboratively to generate novel and useful ideas (Paulus, 2000).

While the cognitive processes promoting creativity may be similar at both the individual and group levels, group creativity is unique because of the ways in which social interactions affect creativity. For instance, social processes that improve group creativity include information sharing, synergistic coordination, and motivation and goal setting (Paulus, 2000; Thompson, 2003; West, 2002). Thus, group creativity can be achieved in two ways: first, group creativity can result from the aggregated efforts of creative individuals (e.g., individuals working independently and then aggregating their separate project components); second, the interaction of group members can synergistically enhance group creative processes (Pirola-Merlo & Mann, 2004).

Beyond the different ways by which group creativity can be achieved, group creativity can also be assessed according to different criteria. Steiner's (1972) typology of group tasks distinguishes between *disjunctive* tasks, where the best group member determines group performance, and *additive* tasks, in which group members' performance can be summed to determine group performance. This typology is useful for categorizing group creativity. With disjunctive creativity, the most creative idea by an individual member determines overall group creative performance (Pirola-Merlo & Mann, 2004). Examples of disjunctive creativity include groups who are tasked with solving an insight problem in which only a limited number of solutions exist (e.g., the Duncker candle task). In these tasks, the creative insight of a single group member can lead to success for the entire group. With additive creativity, individual members' creative ideas can be aggregated to determine group creative performance (Pirola-Merlo & Mann, 2004). Examples of additive group creativity tasks include idea generation tasks (e.g., brainstorming). Creative performance on these tasks requires the input of the entire group.

DIMENSIONS AND ACTIVATION OF COUNTERFACTUALS

A growing literature has examined the cognitive and social inhibitors and stimulants of group creativity (e.g., Diehl & Stroebe, 1987; Paulus, 2000). We add to this literature by considering the impact of counterfactual thinking. When individuals consider "If only" and what might have been, they are imagining alternatives to past events and outcomes. These reflections are termed *counterfactual thoughts*. Counterfactuals tend to be conditional statements in which outcomes are mentally "undone" and possible changes to the outcome are contemplated (Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Pennington & Roese, 2003; Roese, 1994). For instance, when an individual considers what might have been had he attended a different university, accepted a different job, or moved to a different state, he is engaging in counterfactual thinking.

Cognitive and social psychologists have studied both the antecedents and the consequences of counterfactual reflection. In terms of antecedents, Kahneman and Tversky (1982) argued that people tend to undo abnormal events by mentally altering antecedents that are perceived to be atypical. Moreover, close calls or near misses, in which an alternative outcome is easily generated, are also likely to stimulate counterfactual thinking. A classic example is that a flight missed by 5 min is more likely to generate counterfactual thoughts than a flight missed by 1 h, because it is easier to mentally undo antecedent events leading up to the narrowly missed flight (Kahneman & Tversky, 1982). Finally, negative, unexpected, or surprising events increase the production of counterfactual thoughts (Roese & Hur, 1997; Roese & Olson, 1997; Sanna & Turley, 1996).

In considering the consequences of counterfactual thought, it is important to note that people rarely ponder just how things could have been different, but rather how things could have been better or worse (Mandel, 2005), or how things could have been added or subtracted from what actually occurred (Roese, 1994). These two dimensions of counterfactual thought – direction and structure – determine the effect that counterfactual thinking has on a range of variables. With regard to direction, *upward counterfactuals* consider alternatives that are better than the current reality (Roese, 1994, 1997). For example, a student who does poorly on an exam might consider the following upward counterfactual: "If only I had studied more, I would have earned a better grade." Because upward counterfactuals imagine improvements to past outcomes, these counterfactuals tend to generate emotions such as regret and disappointment, yet serve a preparative function by guiding future behavior (Markman, Gavanski, Sherman, & McMullen, 1993; Roese, 1994; Roese & Olson, 1995). In contrast, *downward counterfactuals* consider alternatives that are less positive than the current reality by focusing on how things could have been worse (Roese, 1994, 1997). For instance, the same student who did poorly on an exam might think, "It's a good thing that I went to the review session or I could have failed." By imagining outcomes that are worse than reality, downward counterfactuals elevate affect by generating relief and surprise but may leave individuals less motivated to improve future performance (Roese & Olson, 1995, but see also McMullen & Markman, 2000).

Another dimension of counterfactuals is how they are structured; this dimension focuses on whether antecedents are added or subtracted from the past event. *Additive counterfactuals* reconstruct reality by adding antecedents (e.g., "If only I had brought my calculator, I would have done better"). In generating these additions people are generally quite specific (i.e., focus on one particular change), but also more creative (i.e., involve imagination of any number of possible antecedents; Roese, 1994). In contrast, *subtractive counterfactuals* reconstruct reality by subtracting antecedents (e.g., "If I hadn't gone to the career fair, I wouldn't have found my current job").

Counterfactual thoughts can also be distinguished by the process through which they influence outcomes, which is either *content-specific* or *content-neutral* (Epstude & Roese, 2008). Counterfactuals have content-specific effects when they influence behavioral intentions, and ultimately behavior, through the information contained in the counterfactual thought. Conversely, counterfactuals have content-neutral effects when they indirectly affect behavior through indirect processes, such as motivation.

Having discussed the direction, structure, and processes of counterfactual thoughts, we turn briefly to a discussion of how they are activated. A common approach for examining its cognitive impact is to examine the mind-set that is activated when people have just considered a counterfactual: that is, a counterfactual mind-set gets activated or primed by simply engaging in counterfactual thought. Counterfactual mind-sets are typically activated by having people consider how fictional scenarios could have turned out differently. For example, participants might read about a protagonist, Jane, who is attending the concert of one of her favorite bands. Seating is on a first come, first serve basis. Jane selects a seat, but then later moves to obtain a better view of the stage. At the concert, the announcer reveals that a trip to Hawaii will be given to a lucky fan and that the winner will be determined by the seat number currently occupied. In half the scenarios, Jane wins the trip to Hawaii when the new seat she had just switched to (in order to get a better view of the stage) was chosen, while in the other half, Jane loses the trip to Hawaii when the seat that she had just switched from wins the trip. After reading the scenario, participants are asked to generate some thoughts going through Jane's mind. A typical response to Jane's win might be "Wow, If I hadn't changed seats, I wouldn't have won the trip!" whereas Jane's loss might elicit the thought, "If only she hadn't changed seats she would have won." To activate this mind-set at the group level, participants are asked to read the scenario together and jointly determine some thoughts going through Jane's mind (e.g., Galinsky & Kray, 2004; Kray & Galinsky, 2003).

Simply reading the scenario in which Jane switches seats influences decision-making, group interaction, and creative expression. What is remarkable is that both the upward and downward counterfactuals lead to the same effects. Because of this, Galinsky and Moskowitz (2000) used the phrase "counterfactual mind-set" because *processes* of thought, as opposed to the *content* of thoughts, appeared to be driving the effects. The effects of counterfactual mind-sets are thus content neutral.

Counterfactual thoughts may also be primed when people communicate their counterfactual thoughts to others. Although both counterfactual mind-sets and counterfactual communication activate a consideration of "what if," the effects of counterfactual communication are content specific, meaning that the content of the counterfactual is important information that can be utilized in future actions (Epstude & Roese, 2008). For example, after a failed presentation, one colleague may tell another how the presentation could have been better had he included more technical information. In this counterfactual, the technical information is viewed as a causal factor influencing the presentation outcome, and thus, may directly affect future behavior.

Now that we have articulated the dimensions and mechanisms of activation of counterfactual thoughts that are relevant to a range of outcome measures, we now focus more specifically on the relationship between counterfactuals and creativity. We propose that counterfactuals affect group creativity through its effects on cognitive and social group processes. These relationships are depicted in Fig. 1. Although there are a number of

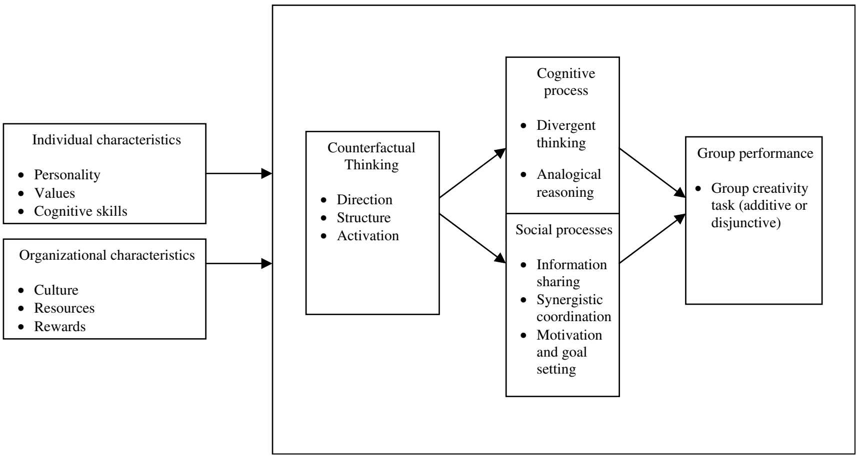

Fig. 1. A Model of Counterfactual Effects on Group Creativity.

cognitive and social processes on which we could focus, we limit our consideration to those processes that have been previously identified as positively influencing creativity. We focus on the cognitive processes of divergent thinking and analogical reasoning; the social processes we consider are information sharing, synergistic coordination, and motivation and goal setting. Our model also acknowledges the role of other variables that might play important moderating roles in this process, including individual and organizational characteristics; however, our primary discussion will focus on counterfactual thinking, creative group performance, and potential underlying cognitive and social group processes.

COUNTERFACTUALS AND COGNITIVE PROCESSES IN GROUP CREATIVITY

Below we detail the relationship between counterfactual thinking and two cognitive processes associated with creativity: divergent thinking and analogical reasoning.

Divergent Thinking and Counterfactual Mind-Sets

Creativity is often equated with divergent, as opposed to convergent, thinking (Milliken, Bartel & Kurtzberg, 2003). The former task requires dispersed attention (Anastasi, 1982), whereas the latter is characterized by convergence on a single response (Thompson, 2003). Divergent thinking, which is frequently referred to as ''thinking outside of the box,'' can be stimulated by open-ended questions and the consideration of impossibilities (Thompson, 2003). Thompson notes that divergent thinking helps individuals better identify influential factors in opposing scenarios and that doing so prevents drawing premature conclusions. Because counterfactual thinking involves the consideration of alternatives and multiple perspectives, we expect it to prevent premature convergence on initial creative ideas and to promote an appreciation for divergent perspectives.

The notion that counterfactual primes increase the ability to identify opposing or different viewpoints was first supported in research by Galinsky and Moskowitz (2000), who examined the effects of counterfactual primes on the Duncker Candle problem (Duncker, 1945). In this ''thinking outside of the box'' task, participants are shown three objects: a small candle, a full book of matches, and a box filled with thumbtacks. They are then asked to affix the candle to a wall such that it will burn properly and not drip wax onto the floor. The correct solution requires people to recognize that the box may function not only as a container, but also as a platform. The tacks can be dumped out of the box and the box tacked to the wall to support the candle. Participants tend to focus on the typical singular function of the box as a container and thereby fail to see the novel use for it that is required to solve the problem. However, activating a counterfactual mind-set resulted in dramatic improvement in solution rate (56%) relative to a baseline condition (6%, Galinsky & Moskowitz, 2000, Experiment 1), suggesting that counterfactual mind-sets lead people to consider a broader range of alternatives. Although this study was conducted at the individual level, we might expect that similar effects would emerge at the group level: if there are more group members present, the likelihood that the correct solution will be identified should increase on this disjunctive task.

Beyond the identification of multiple perspectives, counterfactual mind-sets might also improve divergent thinking by increasing group members' resistance to premature conclusions. Kray and Galinsky (2003) examined whether those exposed to counterfactual primes were more likely to arrive at a correct decision through the use of disconfirmatory information, than were those in a control (noncounterfactual) condition. They tested this prediction using the Carter Racing case, where individuals work together to make tactical decisions as part of a racecar team (Brittain & Sitkin, 1986). While the context of the case is fictional, the decisions teams made were based on actual data from the Space Shuttle Challenger accident. The quandary facing the team was whether or not to race in an event that was marked by exceedingly cold temperatures. Information given to the teams was ambiguous with regard to whether engine failure was magnified in cold temperatures. Participants were given a chart that only contained information about the air temperature when the car experienced engine failure, and did not include any information on races that did not experience any problems. Reaching the correct decision in this case (concluding *not* to race) requires teams to request information about air temperatures during successful races, which reveals a strong correlation between race success and ambient temperature. Because counterfactual mind-sets aid awareness of alternatives, groups exposed to the counterfactual prime requested information regarding the successful races, thereby entertaining the alternative hypothesis that a relationship exists between air temperature and engine failure. Mediation analyses indicated that counterfactual primes increased the generation of counterfactual thoughts, which in turn increased the search for disconfirmatory information, and ultimately improved decision accuracy.

By increasing the awareness of different perspectives and the search for disconfirmatory information, counterfactual mind-sets may aid group creativity in several different ways. First, awareness of alternatives may increase performance on creative association tasks. As Galinsky and Moskowitz (2000) illustrated, performance on some creative association tasks requires that people be able to overcome their biases (e.g., functional fixedness) and be able to see alternative functions in order to solve the problem. Because creative association tasks are disjunctive, they require only one member of the group to make the necessary connection. As counterfactual mind-sets increase awareness of alternatives, they may increase group creativity by enabling people to view the problem or resources from a different perspective, thereby increasing the chances that at least one group member will generate the necessary solution. Second, the findings from Kray and Galinsky (2003) suggest that awareness of alternatives increases people's search for disconfirmatory evidence. To the extent that creative association tasks require one correct solution, identifying this disconfirmatory evidence increases the likelihood of more accurate decisions.

The search for disconfirmatory evidence following counterfactual mind-set activation may also decrease the conformity pressure that impairs additive group creative tasks, such as brainstorming (Thompson, 2003). Increased awareness of different perspectives may affect group members' willingness to listen to dissenting perspectives. Research on minority dissent finds that groups are more likely to demonstrate creative idea generation when they are exposed to minority perspectives, compared to when no dissent is voiced. For instance, Nemeth (1986) explored how effectively groups created words from strings of letters (e.g., DAMrpt). Nemeth found that groups exposed to minority dissent were more likely to form more words using forward (e.g., dam), backward (e.g., mad), and mixed sequencing (e.g., pad) than were those exposed to only the majority perspective. Nemeth interpreted this as evidence for the positive relationship between minority dissent and divergent thinking. As applied to the present chapter, counterfactual thinking may increase a group's willingness to listen to minority dissent, and in turn, exposure to these differing perspectives may improve creative idea generation.

In summary, we propose that through the effect of counterfactual mind-sets on individuals' awareness of alternatives, performance on creative association tasks and creative idea generation tasks will improve. The search for disconfirmatory evidence following counterfactual mind-set activation may also decrease the conformity pressure that impairs group brainstorming (Thompson, 2003). Increased awareness of alternatives may affect group members' willingness to listen to dissenting perspectives.

Divergent Thinking and Counterfactual Structure

In the previous section, we argued that counterfactual mind-sets in general are associated with processes that improve divergent thinking. In this section, we argue that the structure of the counterfactual mind-set is crucial in determining how these mind-sets are associated with divergent and convergent thinking. Specifically, we propose that additive counterfactual thoughts that add some factor to the original event conditions will improve divergent thinking more so than counterfactuals that delete an antecedent factor from the original event conditions.

Kray et al. (2006) first examined the effects of subtractive counterfactual mind-sets (i.e., mentally deleting an antecedent) on individual-level creativity. They argued that these mind-sets promote a *relational processing style* characterized by a tendency to consider relationships and associations among a set of stimuli. Consistent with this processing style, counterfactual mind-sets facilitated performance on creative association tasks, including Law School Admissions Test (LSAT) problems and the Remote Associates Task (RAT; Mednick, Mednick, & Mednick, 1964) by allowing people to recognize connections. Conversely, subtractive counterfactual mind-sets impaired performance on creative idea generation tasks, such as brainstorming new pasta names and drawing a creature from another planet, because they structure thought and imagination. To the extent that divergent thinking aids performance on idea generation tasks, the implication of these findings is that subtractive counterfactual mind-sets decrease divergent thinking.

In contrast to performance on idea generation (i.e., additive) tasks, Kray et al.'s (2006) research indicates that subtractive counterfactual mind-sets *improve* individual performance on disjunctive tasks such as the RAT, LSAT, and Duncker Candle problems. This occurs because the counterfactual mind-set elicits relational processing. In this cognitive state, participants are able to foster connections between stimuli. This same logic carries over to the group level as well. Since disjunctive tasks require associations to be made, relational processing is likely to increase disjunctive task performance. Given that only one individual needs to arrive at the correct answer in order to solve this task, we predict that subtractive counterfactual mind-sets impact group performance on creative association tasks in the same manner as they do at the individual level: When one individual in the group is able to identify the correct solution, she or he increases the group's creative performance.

While Kray et al. (2006) examined the effects of subtractive counterfactual mind-sets on creativity, Markman et al.(2007) drew on Roese's (1994) assertion that additive counterfactuals are more creative, and posited that additive counterfactual mind-sets promote the broadening of conceptual attention. As such, people in these mind-sets are likely to do better on creative generation tasks. In support of this prediction, they examined the effects of counterfactual structure on novel idea generation (e.g., Scattergories, uses for a brick). They found that participants who generated additive counterfactuals performed better – their work was rated as more novel – than did those who generated subtractive counterfactuals or no counterfactuals.

Recent negotiation research (conducted at the dyadic level) has implications for the effects of counterfactual thinking on group creativity. One way in which negotiators can be creative is to explore interests that underlie stated positions and to craft a novel solution to an impasse by addressing those interests. Using both the rock concert mind-set activation prime and a more individualistic account of counterfactuals from participants' past negotiations, Kray, Galinsky, and Markman (2009) demonstrated that negotiators who generated additive counterfactuals were subsequently more likely to create an integrative deal than were negotiators who generated subtractive counterfactuals. By adding hypothetical elements to the past, an expansive processing style is invoked that aids in creative generation (cf. Guilford, 1950). Taken together this research on additive counterfactual mind-sets may work to improve divergent thinking within groups.

Beyond divergent thinking, the structure of the counterfactual may also influence another valuable tool in the creative process: analogical reasoning (Gentner, Brem, Ferguson, & Wolff, 1997; Thompson, 2003). A simple analogy such as "tree is to forest as water is to ocean" illustrates comparable relationships across distinct domains. Analogical reasoning facilitates creativity by allowing the value of an idea or solution from one domain to be recognized in the current domain. For example, Edison's development of an electric light system borrowed heavily from his knowledge of gas light systems: the light bulb was originally called a burner and was designed to approximate the same amount of light emitted by a candle (Weisberg, 1997). An additional benefit to analogical reasoning in group creative contexts is that one group member's infeasible idea may lead another member to engage in analogical reasoning to identify a more appropriate solution. Because subtractive counterfactuals have been shown to promote a relational processing style, analogical reasoning should be facilitated by subtractive counterfactual thinking.

Divergent Thinking and Counterfactual Communication

The above discussion has centered on the impact of counterfactual mind-sets, or the ways in which thinking counterfactually influences subsequent creative performance. However, it is possible that counterfactuals may also directly affect group creativity through the communication of creative thoughts. In other words, whereas counterfactual mind-sets focus on the intrapersonal cognitive orientation of *thinking* about alternatives, counterfactual communication is interpersonal and involves explicitly *communicating* a counterfactual between a sender and a receiver. Counterfactual communication may be particularly important in groups because sharing thoughts regarding how something could have been better may be important to individual and group learning and future performance (Wong, 2009). Moreover, unlike counterfactual mind-sets, the content of the counterfactual thought plays an important informational role that guides behavioral intentions and future performance (Roese, 1994; Wong, 2007).

Although research has yet to examine the role of counterfactual communication on cognitive processes related to group creativity, there are two ways in which counterfactual communication might impact divergent thinking. First, it is possible that the communication of counterfactuals will stimulate counterfactual thinking, which in turn will activate an awareness of multiple perspectives and a search for disconfirmatory information. Second, by verbalizing these "what ifs," other group members may also begin to consider or share their counterfactuals, thereby increasing the diversity of ideas and potentially piggybacking off each others' ideas. These behaviors benefit divergent thinking and hence may contribute to higher levels of performance on additive group tasks.

COUNTERFACTUALS AND SOCIAL PROCESSES IN GROUP CREATIVITY

In this section, we consider group creativity that arises due to social processes. An assumption underlying most models of group creativity is that group processes moderate the relationship between group knowledge and creativity (e.g., West, 2002). For instance, Paulus (2000) focuses on both social stimulation (e.g., competition/accountability and upward comparisons/goals) and cognitive stimulation (e.g., attention, conflicts, incubation) in discussing factors that generate high creativity in groups. Likewise, in a model of group processes affecting group creativity and innovation, West (2002) attends to processes including group commitment, conflict management, and minority influence. In this section, we focus on the processes that have been associated with stimulating creativity, which include information sharing, synergistic coordination, and motivation and goal setting.

Information Sharing

Information Sharing and Counterfactual Mind-Sets

Group diversity is an important factor in creative group performance (e.g., Paulus, 2000; Thompson, 2003; West, 2002) because diverse group members will have access to different information, perspectives, and experience, which should ultimately improve performance. However, groups are rarely as successful as we would hope. Groups' inability to achieve novel combinations may stem from their inability to share information efficiently (Paulus, 2000). A large body of research indicates that information sharing in groups is biased such that group members tend to discuss shared information as opposed to unique information (Larson, Foster-Fishman, & Keys, 1994; Stasser & Stewart, 1992; Stasser & Titus, 1985; Winquist & Larson, 1998).

Building on Kray and Galinsky's (2003) link between counterfactual mind-sets and the search for disconfirmatory information, Galinsky and Kray (2004) argued that these mind-sets might also increase the likelihood that groups would share unique information. Galinsky and Kray tested this predication by having the groups complete Stasser and Stewart's (1992) murder mystery task. In this task, groups were told that they were investigating a homicide and group members are given clues from which they must identify a suspect. Galinsky and Kray found that groups exposed to the Jane scenario designed to elicit counterfactuals were more likely to identify the correct suspect than were those who were exposed to a neutral scenario. Groups exposed to the counterfactual scenario were more likely to discuss information originally held by only one group member than were those exposed to the noncounterfactual scenario, which suggests that counterfactual mind-sets increased discussion of unique information that ultimately increased decision-making accuracy.

An implication of Galinsky and Kray's (2004) work is that, through the sharing of unique information, counterfactual mind-sets may increase group creativity. Specifically, information sharing may improve performance on additive tasks. To the extent that sharing unique information allows group members to build off others' ideas, this may increase divergent thinking, fluency, and flexibility of ideas. However, Galinsky and Kray's research also suggests that disjunctive task performance may be improved through counterfactual mind-sets. Through the sharing of unique information, groups were better able to identify the one correct solution. Given that disjunctive tasks have one correct response, it is therefore possible that, through the sharing of unique information and perspectives, disjunctive task performance may also increase. In sum, sharing of unique information may benefit both types of creative task performance.

Information Sharing and Counterfactual Communication
We expect that the extent to which counterfactual communication improves information sharing may depend on group members' relationships with one another. Research from the impression management literature suggests that performance-enhancing behaviors, such as feedback seeking, may be avoided if people are concerned that they might have a negative effect on the impressions others form of them (Ashford & Northcraft, 1992; Lee, 1997). As applied to counterfactual communication, while the sharing of counterfactuals might improve performance, individuals may avoid sharing them if doing so could affect others' perceptions of them. Such an effect may be similar to the evaluation apprehension that has been documented to inhibit group creativity (Diehl & Stroebe, 1987).

Group members, however, may be more willing to share their counterfactual thoughts if there is a high level of trust and psychological safety, which refers to "a shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 354) in the group. By sharing this information, the team may achieve higher levels of creative group performance. Depending on the content of the counterfactual communicated, it is possible that both additive and disjunctive creative task performance may be improved in a similar fashion as with counterfactual mind-sets. On the one hand, additive task performance may be increased when sharing information leads to building off each others' ideas, and in turn, higher fluency scores, for example. On the other hand, disjunctive task performance may also be improved as group members share information and potentially isolate the one correct answer.

Synergistic Coordination and Counterfactual Mind-Sets

Synergistic coordination refers to increased information sharing, increased receptivity to others' ideas, and increased ability to coordinate and integrate this information (Liljenquist, Galinsky, & Kray, 2004). Liljenquist et al. (2004) hypothesized that the impact that counterfactual mind-sets have on group tasks will depend on how they are activated. They expected that considering counterfactual worlds collectively would create synergistic coordination but that considering counterfactuals individually would create silos separating group members from each other. Consistent with this hypothesis, when groups collectively constructed counterfactual thoughts, group performance and information sharing were facilitated. However, when each individual privately constructed counterfactual thoughts, group members were unable to effectively share their thoughts and coordinate their information.

In terms of group creativity, since disjunctive tasks require that individuals work together to share information, disconfirm current beliefs, engage in hypothesis testing, and identify the one correct solution, the collective activation of counterfactual mind-sets should benefit performance on this type of task by promoting synergistic coordination. This reinforces the notion that counterfactual mind-sets can have cognitive and social influences on group creativity – not only will counterfactual mind-sets allow group members to generate a wide variety of alternatives, but they will be more willing and able to integrate these differing views together.

With regard to additive tasks, group-level counterfactual mind-sets may have an ironic impact on team performance. Creativity research suggests that task conflict is a key process to idea generation (Paulus, 2000). Because counterfactual mind-sets increase synergistic coordination, it is possible that the increased coordination may come at the expense of task conflict. Thus, counterfactual mind-sets may increase disjunctive task performance through their effects on synergistic coordination but decrease additive task performance due to decreased task conflict.

Motivation, Goal Setting, and Counterfactuals

Models of creativity at both the individual and group level have suggested the importance of motivation (e.g., Amabile, 1988; Ford, 1996; Paulus, 2000). For example, Paulus (2000) applied goal-setting research to the creative process and proposed that specific goals and explicit feedback about performance can improve additive task performance. Counterfactual research has likewise demonstrated links to motivation, suggesting that an integration of these literatures may be fruitful. While in previous sections we have distinguished between counterfactual mind-set and communication effects, in this section, we find it helpful to draw upon content neutral and specific counterfactual effects because previous research suggests that the content of the counterfactual is key to the influence of counterfactuals on motivation (Roese, 1994).

Motivation and Content-Neutral Counterfactuals

One means by which counterfactual generation may benefit group motivation, and ultimately creativity, is by enhancing the meaning of group members' shared endeavor. We use the term mutability to refer to the mental ease with which aspects of reality are imaginatively altered. By extrapolating from mutability, individuals perceive a structure to their lives and the world in which they live. To be sure, finding meaning *from* mutability is in a sense ironic; the recognition of multiple possibilities might make the world seem capricious, even random. Yet because our brains work overtime to impose meaning in the face of surprising circumstances, the consideration of ''what might have been'' can produce beliefs that render one's life and experiences all the more remarkable, and hence, all the more meaningful (Galinsky, Liljenquist, Kray, & Roese, 2005). In an empirical test of this idea, Kray et al. (in press) recently determined that counterfactual thinking enhances meaning in life for pivotal turning points. By considering how life would be different if these transitions had never occurred, the growth, lessons, and ''silver linings'' of events from the past crystallize. In the context of groups, the belief that their shared activity is meaningful will likely increase group members' intrinsic motivation and commitment to the task at hand, which will very likely increase their creative output.

Motivation and Content-Specific Counterfactuals

Research on counterfactuals has demonstrated its effects on motivation. Some have argued that counterfactuals can function as a form of goal-setting such that upward counterfactuals provide explicit goals and increase accountability to these goals (Roese, 1994). For instance, Morris and Moore (2000) found that aviation operators who made upward counterfactuals about things they personally could have done better were more likely to learn from near accidents than were those who generated other forms of counterfactuals (e.g., other-focused, or downward counterfactuals). Wong (2007) explored the impact of counterfactual communication on motivation and argued that the direction of the counterfactual (upward vs. downward) communicated by a speaker would have differential effects on receivers' motivation and that this relationship would be mediated by impression formation. She found that speakers who communicated upward counterfactuals were more positively perceived than were those who communicated downward counterfactuals, and that these impressions were positively related to receivers' future motivation and performance.

Finally, Kray and Haselhuhn (2007) found that individuals with incremental beliefs of negotiation ability (i.e., that negotiation skills can be learned) were more likely to achieve integrative outcomes and have higher grades at the end of a negotiation course than were those who held entity beliefs of negotiation ability (i.e., negotiation skill is fixed). Wong, Haselhuhn, and Kray (2009) posit that counterfactual direction might be one underlying mechanism driving this relationship between counterfactuals and performance. In particular, they hypothesized and found that incremental beliefs increased the generation of upward counterfactuals, thereby allowing them to learn from their previous experiences (cf. Kray et al., 2009). In contrast, entity beliefs led to the generation of downward counterfactuals, which typically do not promote learning from the past. Together these findings suggest that upward counterfactuals may increase motivation and function as a form of goal setting.

In considering the implications of this discussion for group creativity, it is important to note that disjunctive tasks merely require the ability to identify relationships among stimuli. This ability is unlikely to be affected by motivation. For instance, one could be highly motivated to exert effort and persist on a RAT problem, in which the connection between three seemingly unconnected words must be made (e.g., chocolate– fortune–tin), but if the connection cannot be identified, no benefit to creativity will be obtained from this motivation. Conversely, additive tasks include sheer measures of quantity, which is a product of effort. Therefore, if upward counterfactuals increase motivation to generate more ideas, then additive task performance may increase. In summary, upward counterfactual generation may increase motivation and lead individuals and teams to set higher goals. This increased motivation should improve performance on additive tasks but not disjunctive tasks. Initial support for this prediction is supported by Markman, McMullen, and Elizaga (2008), who found that upward counterfactuals enhanced anagram performance (arguably, an additive task), and, moreover, the effect of counterfactual thinking on performance was mediated by motivation (as indicated by task persistence).

In this section, we have considered the ways in which counterfactual mind-sets affect group creativity through their impact on group creative processes. We proposed that increased information sharing would increase performance on additive and disjunctive tasks. In contrast, synergistic coordination and motivation were expected to influence each type of creative task differently. While synergistic coordination was expected to increase performance on disjunctive tasks and decrease performance on additive tasks, motivation was predicted to improve performance only on additive tasks.

RESEARCH AGENDA

In this chapter, we suggested that counterfactual mind-sets affect group creativity through cognitive processes (e.g., divergent thinking) as well as social processes (e.g., information sharing, synergistic coordination, motivation, and goal setting). In this final section, we develop a research agenda.

Group Creativity: Additional Processes and Perspectives

Additional Processes

While we have argued that counterfactual thinking affects group creativity through its influence on cognitive and social group processes, beyond these processes, it may be useful to consider how counterfactuals impact group creativity through its influence on affect. Experimental research on induced positive affect and creativity has typically found that positive affect as opposed to negative affect increases one's ability to make word associations, relate various stimuli, use and create categories, and solve insight problems (e.g., Amabile, Barsade, Mueller, & Staw, 2005; Isen & Baron, 1991, but for an exception see George & Zhou, 2002).

As previously mentioned, research has established links between counterfactual thinking and emotion. Specifically, downward counterfactual thinking has been linked with more positive affective states (as these thoughts allow people to feel better about a particular outcome), while upward counterfactual thinking has been associated with more negative affective states (as these thoughts remind people of how things could have been better). Therefore, holding all else equal, downward counterfactual generation may enhance creativity to a greater extent than upward counterfactual generation through its influence on affect. Given that affect in groups may spread from one group member to another (Barsade, 2002), downward counterfactuals may enhance creativity at both the individual and group level.

Additional Perspectives

While our discussion on group creativity has attended to the task structure as either additive (sum of the group members' creativity) or disjunctive (one member identifies the correct solution), one other notion of group creativity that is less frequently considered is that group creativity may involve ''each individual mak[ing] a contribution, but the importance of that contribution to the creativity of the group product is weighted in some way (e.g., the most creative member's contribution is the most important)'' (Pirola-Merlo & Mann, 2004, p. 238). The key to this perspective is how weights might be assigned.

Based on research examining counterfactual communication and its impact on performance, it is possible that the way in which counterfactual thinking is activated may affect this weighting process. Recall that Wong (2007) explored the impact of counterfactual communication on motivation and found that speakers who communicated upward counterfactuals were more positively perceived than were those who communicated downward counterfactuals, and that these impressions were positively related to receivers' future motivation and performance. Through its effect on impression formation, we expect that counterfactual communication will influence the weighting of individual member contributions to group creativity. Group members who communicate upward counterfactuals will be more positively viewed by other members of their team and may therefore be more influential. Weighting of individual member contributions may be more important for additive, or creative idea generation tasks, than for disjunctive tasks, which involve a single correct solution.

Moreover, this notion of weighting of creative ideas may have implications for the innovation process, and in particular the process by which creative ideas are implemented. According to Kanter (1988), the innovation process includes idea generation, coalition building, idea realization, and transfer. This notion of weighting may also be pertinent to coalition building such that individuals with higher status or expertise are viewed as more creative, important, or having more potential. To the extent that those with higher status or expertise are able to form coalitions to support their ideas, weighting may affect not only group creativity but also innovation processes.

The Impact of the Organizational Context

In this chapter, we acknowledged the importance of the organizational context (e.g., culture) but focused on the impact of counterfactual thinking on group creativity. We did so in order to gain a basic understanding of the influence of counterfactuals on group creativity, holding constant other factors that might help or hinder counterfactual effects on group creativity. However, moving forward, it will be important to consider several issues relating to counterfactuals and group creativity in organizational contexts.

First, our research has typically been conducted in laboratory settings. In future research, it will become important to determine methods by which counterfactual mind-sets can be activated and sustained in organizations. Models of group creativity (e.g., Amabile, 1988) highlight the importance of team and organizational variables such as team values and norms as well as organizational resources.

Team Values and Norms

Recall that Wong (2009) notes that while individuals may generate counterfactual thoughts, they may not be willing to share such thoughts with others out of concern for how it might affect others impressions of them. As such, Wong, Galinsky, and Kray (2008) suggest the importance of psychological safety. If individuals feel safe, they will be more willing to share their counterfactual thoughts and therefore the potential benefits to group creativity might be realized.

Beyond psychological safety, another important value for the relationship between counterfactuals and creativity may be valuing failure. Such a perspective is at the heart of the culture of IDEO, an innovation and design firm. They view failure as "the best way to clear the fog to see a path to success" (Rodriguez & Jacoby, 2007, p. 56). Valuing failure may also increase individuals' willingness to share counterfactual thoughts, particularly those that consider how things could have been better after negative events. It is through this communication of counterfactuals that information is shared, which we have argued is related to increased group creativity.

Organizational Resources

Most models of organizational creativity and/or innovation consider the role of organizational resources. We expect organizational processes and resources such as reward systems, education, and information systems to influence counterfactual thinking in organizations. Reward systems need to support values and norms, in this case, psychological safety and valuing failure. One way in which organizations can reward counterfactual thinking is by providing incentives to report such thoughts. For instance, in the Aviation Safety Reporting System (ASRS), aviation operators voluntarily submit incident reports. Such reports might detail near accidents, passenger misconduct, or mechanical problems. Aviation operators are guaranteed confidentiality in their reports and are provided incentives to report, such as waiving fines or penalties for unintentional violations of aviation laws and regulations (ASRS, 2008). Although the extent to which the entire population of aviation operators utilizes this system cannot be determined, it has certainly functioned to increase flight safety through discussion of the incident and the lessons learned.

CONCLUSION

In this chapter, we acknowledged the importance of mental simulation on creativity. We proposed that counterfactuals influence creativity through its effects on cognitive processes (e.g., divergent thinking) and social processes (e.g., information sharing, synergistic coordination, motivation, and goal setting). In this way, we developed a model that articulates the impact of counterfactuals on group creativity. Finally, we aim to stimulate research on counterfactuals and group creativity through not only our model but also our research agenda.

REFERENCES

Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, *45*, 357–376.

Amabile, T. M. (1988). A model of organizational innovation. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 10, pp. 123–167). Greenwich, CT: JAI Press.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*, 367–403.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*, 1154–1184.

Anastasi, A. (1982). *Psychological testing*. New York, NY: Macmillan.

Ashford, S. J., & Northcraft, G. B. (1992). Conveying more (or less) than we realize: The role of impression-management in feedback-seeking. *Organizational Behavior and Human Decision Processes*, *53*, 310–334.

Aviation Safety Reporting System (ASRS). (2008). *Confidential and incentives to report*. http://asrs.arc.nasa.gov/overview/confidentiality.html (accessed April 2008).

Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly*, *47*, 644–675.

Brittain, J. & Sitkin, S. (1986). *Carter racing*. Dispute Resolution Research Center Exercises, Northwestern University, Evanston, IL.

Cummings, A., & Oldham, G. R. (1997). Enhancing creativity: Managing work contexts for the high potential employee. *California Management Review*, *40*, 22–38.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.

Duncker, K. (1945). On problem solving. *Psychological Monographs*, *58*(5) (Whole No. 270).

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*, 350–383.

Epstude, K., & Roese, N. J. (2008). The functional theory of counterfactual thinking. *Personality and Social Psychology Review*, *12*, 168–192.

Ford, C. M. (1996). A theory of individual creative action in multiple social domains. *Academy of Management Review*, *21*, 1112–1142.

Galinsky, A. D., & Kray, L. J. (2004). From thinking about what might have been to sharing what we know: The effects of counterfactual mind-sets on information sharing in groups. *Journal of Experimental Social Psychology*, *40*, 606–618.

Galinsky, A. D., Liljenquist, K. A., Kray, L. J., & Roese, N. R. (2005). Finding meaning from mutability: Making sense and deriving meaning from counterfactual thinking. In: D. R. Mandel, D. J. Hilton & P. Catellani (Eds), *The psychology of counterfactual thinking* (pp. 110–125). London: Routledge.

Galinsky, A. D., & Moskowitz, G. B. (2000). Counterfactuals as behavioral primes: Priming the simulation heuristic and consideration of alternatives. *Journal of Experimental Social Psychology*, *36*, 257–383.

Gentner, D., Brem, S., Ferguson, R., & Wolff, P. (1997). Analogy and creativity in the works of Johannes Kepler. In: T. B. Ward & S. M. Smith (Eds), *Creative thought: An investigation of conceptual structures and processes* (pp. 403–459). Washington, DC: American Psychological Association.

George, J. M., & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: The role of context and clarity of feelings. *Journal of Applied Psychology*, *87*, 687–697.

Guilford, J. P. (1950). Creativity. *American Psychologist*, *5*, 444–454.

Guzzo, R. A. (1996). Fundamental considerations about work groups. In: M. A. West (Ed.), *Handbook of work group psychology* (pp. 3–24). Chichester, UK: Wiley.

Isen, A. M., & Baron, R. A. (1991). Positive affect as a factor in organizational behavior. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 13, pp. 1–53). Greenwich, CT: JAI Press.

Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, *93*, 136–153.

Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In: D. Kahneman, P. Slovic & A. Tversky (Eds), *Judgment under uncertainty: Heuristics and biases* (pp. 201–208). New York: Cambridge University Press.

Kanter, R. M. (1988). When a thousand flowers bloom: structural, collective, and social conditions for innovation in organizations. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 10, pp. 169–211). Greenwich, CT: JAI Press.

Kray, L. J., & Galinsky, A. D. (2003). The debiasing effect of counterfactual mind-sets: Increasing the search for disconfirmatory information in group decisions. *Organizational Behavior and Human Decision Processes*, *91*, 69–81.

Kray, L. J., Galinsky, A. D., & Markman, K. D. (2009). Counterfactual structure and learning from experience in negotiations. *Journal of Experimental Social Psychology*, *45*, 979–982.

Kray, L. J., Galinsky, A. D., & Wong, E. M. (2006). Thinking inside the box: The relational processing style elicited by counterfactual mind-sets. *Journal of Personality and Social Psychology*, *91*, 33–48.

Kray, L. J., George, L. H., Liljenquist, K. A., Galinsky, A. D., Tetlock, P. E., & Roese, N. J. (in press). From what might have been to what must have been: Counterfactual thinking creates meaning. *Journal of Personality and Social Psychology*.

Kray, L. J., & Haselhuhn, M. P. (2007). Implicit negotiation beliefs and performance: Longitudinal and experimental evidence. *Journal of Personality and Social Psychology*, *93*, 49–64.

Larson, J. R., Foster-Fishman, P. G., & Keys, C. B. (1994). Discussion of shared and unshared information in decision-making groups. *Journal of Personality and Social Psychology*, *67*, 446–461.

Lee, F. (1997). When the going gets tough, do the tough ask for help? Help seeking and power motivations in organizations. *Organizational Behavior and Human Decision Processes*, *72*, 336–363.

Liljenquist, K. A., Galinsky, A. D., & Kray, L. J. (2004). Exploring the rabbit hole of possibilities by myself or with my group: The benefits and liabilities of activating counterfactual mind-sets for information sharing and group coordination. *Journal of Behavioral Decision Making*, *17*, 263–279.

Mandel, D. R. (2005). In: D. R. Mandel, D. J. Hilton & P. Catellani (Eds), *The psychology of counterfactual thinking* (pp. 1–7). New York: Routledge.

Markman, K. D., Gavanski, I., Sherman, S. J., & McMullen, M. N. (1993). The mental simulation of better and worse possible worlds. *Journal of Experimental Social Psychology*, *29*, 87–109.

Markman, K. D., Lindberg, M. J., Kray, L. J., & Galinsky, A. D. (2007). Implications of counterfactual structure for creative generation and analytical problem solving. *Personality and Social Psychology Bulletin*, *33*, 312–324.

Markman, K. D., McMullen, M. N., & Elizaga, R. A. (2008). Counterfactual thinking, persistence, and performance: A test of the Reflection and Evaluation Model. *Journal of Experimental Social Psychology*, *44*, 421–428.

McMullen, M. N., & Markman, K. D. (2000). Downward counterfactuals and motivation: The wake-up call and the Pangloss effect. *Personality & Social Psychology Bulletin*, *26*, 575–584.

Mednick, M. T., Mednick, S. A., & Mednick, E. V. (1964). Incubation of creative performance and specific associative priming. *Journal of Abnormal and Social Psychology*, *69*, 84–88.

Milliken, F. J., Bartel, C. A., & Kurtzberg, T. R. (2003). Diversity and creativity in work groups: A dynamic perspective on the affective and cognitive processes that link diversity and performance. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through creativity* (pp. 32–62). New York: Oxford University Press.

Morris, M. W., & Moore, P. C. (2000). The lessons we (don't) learn: Counterfactual thinking and organizational accountability after a close call. *Administrative Science Quarterly*, *45*, 737–765.

Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, *93*, 23–32.

Paulus, P. B. (2000). Groups, teams and creativity: The creative potential of idea-generating groups. *Applied Psychology: An International Review*, *49*, 237–262.

Pennington, G. L., & Roese, N. J. (2003). Counterfactual thinking and regulatory focus. In: S. J. Spencer, S. Fein, M. P. Zanna & J. M. Olson (Eds), *Motivated social perception: The Ontario symposium* (Vol. 9, pp. 277–298). New Jersey: Erlbaum.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: Aggregating across people and time. *Journal of Organizational Behavior*, *25*, 235–257.

Rodriguez, D., & Jacoby, R. (2007, Spring). Embracing risk to learn, grown and innovate. *Rotman Magazine*, pp. 55–58.

Roese, N. J. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology*, *66*, 805–818.

Roese, N. J. (1997). Counterfactual thinking. *Psychological Bulletin*, *121*, 133–148.

Roese, N. J., & Hur, T. (1997). Affective determinants of counterfactual thinking. *Social Cognition*, *15*, 274–290.

Roese, N. J., & Olson, J. M. (1995). Functions of counterfactual thinking. In: N. J. Roese & J. M. Olson (Eds), *The social psychology of counterfactual thinking* (pp. 169–197). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Roese, N. J., & Olson, J. M. (1997). Counterfactual thinking: The intersection of affect and function. In: M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 1–59). New York: Academic Press.

Sanna, L. J., & Turley, K. J. (1996). Antecedents to spontaneous counterfactual thinking: Effects of expectancy violation and outcome valence. *Personality and Social Psychology Bulletin*, *22*, 906–919.

Stasser, G., & Stewart, D. (1992). Discovery of hidden profiles by decision making groups: Solving a problem versus making a judgment. *Journal of Personality and Social Psychology*, *63*, 426–434.

Stasser, G., & Titus, W. (1985). Pooling of unshared information in group decision making: Biased information sampling during discussion. *Journal of Personality and Social Psychology*, *48*, 1467–1478.

Steiner, I. D. (1972). *Group processes and productivity*. New York: Academic Press.

Thompson, L. (2003). Improving the creativity of organizational work groups. *Academy of Management Executive*, *17*, 96–109.

Weisberg, R. W. (1997). Case studies of creative thinking. In: S. M. Smith, T. B. Ward & R. A. Finke (Eds), *The creative cognition approach* (pp. 53–72). Cambridge, MA: MIT Press.

West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, *51*, 355–424.

Winquist, J. R., & Larson, J. R. (1998). Information pooling: When it impacts group decision making. *Journal of Personality and Social Psychology*, *74*, 371–377.

Wong, E. M. (2007). Narrating near-histories: The effects of counterfactual communication on motivation and performance. *Management and Organizational History (Special Issue on Counterfactual History)*, *2*, 351–370.

Wong, E. M. (2009). *It could have been better: The effects of counterfactual communication on impression formation*. Working Paper, Northwestern University, Evanston, IL.

Wong, E. M., Galinsky, A. D., & Kray, L. J. (2008). The counterfactual mind-set: A decade of research. In: K. D. Markman, W. M. P. Klein & J. A. Suhr (Eds), *The handbook of imagination and mental simulation* (pp. 161–174). New York: Psychology Press.

Wong, E. M., Haselhuhn, M. P., & Kray, L. J. (2009). *Learning from the past by looking toward the future: Implicit negotiation beliefs and counterfactual generation*. Working Paper, Northwestern University, Evanston, IL.

CONNECTING THE DOTS: NETWORK DEVELOPMENT, INFORMATION FLOW, AND CREATIVITY IN GROUPS

Monique Ziebro and Gregory Northcraft

ABSTRACT

In today's knowledge-based economy, the ability to produce highly novel and practical ideas is critical to an organization's survival. This paper draws upon social perspectives of creativity (Perry-Smith & Shalley, 2003) and the vital role of recombinant information in creative development (Barron & Harrington, 1981; Hargadon, 2003) to explore information exchange probabilities; exchanges among group members who are deep-level similar fosters incremental creative potential while information exchanges among group members who are deep-level dissimilar fosters radical creative potential. The dynamics of attraction suggest group members are most likely to interact with people who are least likely to facilitate radical creativity. Using a computer simulation we examine how proximity may be used to facilitate information exchanges among deep-level diverse group members to increase the potential for radical creativity. Results suggest the use of proximity to create strong ties among deep-level dissimilar group members may facilitate radical creativity in groups.

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> "No problem can be solved from the same consciousness that created it.
> We must learn to see the world anew." (Albert Einstein as cited in Clark, 1972).

In today's knowledge-based economy, creativity plays an increasingly important role in an organization's ability to both develop and sustain a competitive advantage (Kim & Lee, 2006). As Einstein's quote suggests, at the heart of creativity is seeing things differently, and this often requires seeing things through another's eyes. For this reason, a greater understanding of the group dynamics that might facilitate creativity is increasingly relevant. This paper builds on the social context approach to creativity by using a network-based perspective to evaluate information exchanges within a group and their impact on creative potential. We examine this group creative potential as a series of dyadic exchanges that give rise to either radical or incremental creativity. In particular, we examine the normally creativity-disruptive effects of similarity on network-tie development and information sharing using a computer simulation. We then examine the role of proximity as a countervailing force to overcome similarity effects and promote greater creativity-enhancing network-tie development.

SOCIAL PERSPECTIVES ON CREATIVITY

Within the organizational studies literature, creativity is most frequently defined as the product of the combination of two or more ideas in a unique manner, resulting in the creation of a singular idea that is both novel and appropriate (Hargadon, 2003; Amabile, 1996). Theoretical discussions on the development of creative ideas – those that are both novel and practical – tend to emphasize the importance of the social element to the creative process (Amabile, 1983; Woodman, Sawyer, & Griffin, 1993). Social context plays an important role in the development of creative thought, as communication and interaction with others facilitates the potential to "… see the world anew." Ultimately, exposure to the diverse perspectives of others can aid in the development of ideas that are both novel and practical (Perry-Smith & Shalley, 2003; Hargadon, 2003; Amabile, 1996). Within an organization, an individual's immediate social context is the workgroup, and exposure to high quality or unique information within that workgroup can enhance that individual's ability to develop valued ideas (Portes, 1998; Perry-Smith, 2006).

Interaction with group members plays an important role in determining the range of information available to an individual during the creative process. One way to understand and characterize interaction patterns that produce creative ideas is through a group's relational network structure. The study of group relationships has typically focused on networks that are both static and mature (Granovetter, 1973; Burt, 1976, 1987; Ibarra, 1995; Uzzi, 1996, 1997), and this treatment of networks as inert structures has been cited as a limitation of the network-based approach (Louch, 2000). An understanding of the formative processes that underlie network development is critical to the further theoretical development of the network perspective. A greater comprehension of the processes that underlie network development would enhance the explanatory powers of network theory and enable researchers to better understand and predict the impact of changes in network relationships over time.

Since network ties determine interaction patterns among individuals, the examination of developing networks may reveal important social factors that guide creative thinking in groups. This paper takes a dynamic approach to networks by relying on a computer simulation to analyze the developmental trajectory of network ties over time, the emergent interaction patterns, the implications for information exchange, and, most importantly, the consequent impact of social interaction on creative potential within a group.

RECOMBINANT DIVERGENT THINKING

A discussion of creativity is incomplete without an examination of the processes that underlie the creation of novel and practical ideas. Since creativity is a highly valued commodity in many organizations, it is not surprising that the business literature contains many specific recommendations for enhancing organizational members' creative capacity (Amabile, 1998). Some of these suggestions are designed to increase the convergent and divergent thinking capacities of organizational members, two abilities that are closely linked with the production of creative outcomes.

The development and selection of a creative idea requires both divergent and convergent thought. Convergent thinking is more strongly related to logic-based reasoning, and focuses on the selection of a solution that is appropriate for a given situation (Cropley, 2006); for this reason, convergent thought is most critical when the time comes to move from considering options to choosing one (i.e., during decision implementation). Divergent thinking requires making connections between unique concepts and applying unconventional thinking to traditional methods, thereby producing multiple solutions for a given problem (Barron & Harrington, 1981; Guilford, 1950; Cropley, 2006). Furthermore, divergent thinking is characterized by the tendency to combine ideas in unexpected or unusual ways (Hudson, 1967); consequently, divergent thinking is most directly relevant to discussions of idea generation.

While divergent thinking captures the cognitive processes that underlie idea development, the term recombinant information describes the product that emerges from the reconfiguration of previously related concepts, and/or the juxtaposition of previously unrelated concepts (Hargadon, 2003). From a social perspective of creativity, an exploration of group information sharing tendencies can reveal the impact of social exchange on the quality of recombinant thinking within a group.

RADICAL AND INCREMENTAL CREATIVITY

When diverse pieces of information are united during recombinant thinking, the emergent solution can vary in its uniqueness. The terms ''radical'' and ''incremental'' are used to describe the quality of implementation of a creative idea, or innovation (Kaluzny, Veney, & Gentry, 1974). Similarly, the ideas that underlie an innovation may be assessed as either radical or incremental.

An incremental idea is relatively minor, based on an existing concept, and is often a developmental extension of existing practices (Munson & Pelz, 1979); a radical idea is highly novel, typically unrelated to existing practices, and often represents a departure from the dominant logic (Oldham & Cummings, 1996; Woodman et al., 1993). In essence, an incremental idea represents a logical ''next step,'' while a radical idea represents a step in a different direction. The fundamental difference between radical and incremental concepts is the extent to which new and diverse knowledge is incorporated and applied in a unique manner (Dewar & Dutton, 1986).

Since radical ideas often synthesize knowledge across different domains to generate something novel, Dewar and Dutton (1986) suggest that the range of available knowledge resources should correlate strongly with the tendency to develop radical ideas. Compared to incremental ideas, radical ideas offer a broader number of unique paths for an organization to follow. For this reason, businesses that rely on creativity to power their organization's development might choose to focus on ways they could improve the number and quality of their radical ideas.

Although knowledge-based organizations may emphasize the development of radical ideas, radical ideas are not always inherently better or more valuable than incremental ideas. While radical ideas are often perceived as powerful and transformative, large increases in productivity have resulted from projects based on incremental ideas, such as Six Sigma (Thompson, Miller, Krantz, & Thomas, 2008). Both incremental and radical ideas have their place within an organization, and the total quality of an idea is ultimately contingent upon the relevance of the idea to a given organization and the organization's ability to effectively pursue that idea without detracting from its core competencies. However, since radical creativity is more likely to be hampered by implementation issues (such as resistance to change; e.g., Mizra, 2008) in ways incremental creativity is not, a discussion of the factors that may generate radical creativity is most relevant to organizations that are charged with the production of highly novel ideas and insights. For these reasons, this paper focuses on the factors that influence a group's (or organization's) potential to develop creative ideas.

IMPORTANCE OF INFORMATION EXCHANGE

The potential to generate both incremental and radical ideas is contingent upon the acquisition of information. The ability to effectively exchange information is a powerful predictor of creative potential, even exceeding motivation as a source of potential innovation in the business environment (Monge, Cozzens, & Contractor, 1992). Information exchange can produce creative outcomes when group members pay attention to the ideas developed and have the opportunity to reflect on a given idea (Paulus & Yang, 2000). The potential for information exchange across dissimilar individuals offers the opportunity to develop an idea in a unique direction. When information is not constrained to specific channels and flows freely across functional areas, that information flow permits unique knowledge configurations that may lead to truly creative ideas.

The ability of group members to effectively exchange information determines its probability of use and relative value (Monge et al., 1992). If unique and high-quality information resides in one area of a group, and does not diffuse throughout the group, that information will ultimately be underutilized, resulting in process loss (Miner, 1984) – in this case, the group's inability to fully realize its creative potential.

The free flow and exchange of unique information between individuals should ultimately result in an expanded knowledge base that can increase the number of alternatives generated during the creative process (Csikszentmihalyi & Sawyer, 1995). Effective communication and the exchange of novel information among group members can provide greater creative utility than those communicative behaviors that produce redundant exchanges. Since the ability to combine information is stimulated by interaction with others, communication in the form of debate and discussion plays an important role in increasing group members' ability to make unexpected information recombinations (Nemeth, Personnaz, Personnaz, & Goncalo, 2004). This suggests that interaction with dissimilar others, and the subsequent exposure to their unique perspectives, can enhance a group member's creative-thinking capacities by stimulating divergent thinking.

Since social exchange is an important driver of creativity, it is necessary to understand the contextual factors that may influence the probability of information transfer among group members. The exchange of information requires both time and space, and in the absence of external constraints, these resources are most frequently allocated to preferred interaction partners. For this reason, the perceived attractiveness of a potential interaction partner has a strong influence on the probability of successful information transmission.

ORIGINS OF ATTRACTION

The level of attraction that exists between two group members is typically contingent upon shared characteristics of those two members (McPherson, Smith-Lovin, & Cook, 2001). Attraction stemming from apparent (surface-level) similarity is particularly strong during initial interactions, and homophily is the term coined to describe the cohesive behavior exhibited by surface-level similar peers (Lazarsfeld & Merton, 1954). The effects of homophily extend to the surface-based characteristics of gender, ethnicity, and age (Regans, Zuckerman, & McEvily, 2004; Balkundi, Kilduff, Michael, Barsness, & Lawson, 2007; Bell, 2007). Attraction based on surface-level characteristics is particularly strong in new or unfamiliar contexts, and this effect is amplified among minority individuals (Marsden, 1987). In general, it is widely accepted that group members are interpersonally attracted to similar others – a phenomenon known as the similarity-attraction hypothesis (SAH) (Byrne & Nelson, 1965).

However, the criteria that constitute similarity, and thus drive attraction, are subject to change over time. A relationship that is primarily based on shared surface-level characteristics may lack the gravitas that is crucial to sustaining a strong long-term relationship, ultimately reducing the intensity of a tie (Louch, 2000). While short-term attraction to a network partner is driven by surface-level characteristics, long-term attraction to a network partner is driven by deep-level characteristics (Byrne, 1971; McPherson et al., 2001). Deep-level characteristics include personality factors, values, abilities, beliefs, and perspectives (Bell, 2007). Therefore, long-term attachment among individuals is often contingent upon the presence of similarities that extend beneath the surface.

The desire to connect with others at a deep level may explain why surface-level characteristics alone cannot account for observed patterns of tie formation (Baumeister & Leary, 1995; Lawrence, 1997). Strong ties develop between group members due to joint identification with a category that goes beyond physical similarities (Regans, 2005). Over time, the basis of attraction to group members evolves from surface-level characteristics to deep-level characteristics, including shared political ideology, religion, culture, lifestyle, and values (Griffith & Veitch, 1974; Huston & Levinger, 1978). The presence of shared deep-level characteristics are so critical to the maintenance of a relationship that individuals may even distort the number of deep-level differences in an attempt to maximize perceived similarities (Huckfeldt & Sprague, 1995).

ROLE OF ATTRACTION IN THE ALLOCATION OF TIME

Affiliation and interaction among group members who share a reciprocal attraction can generate positive returns such as emotional support and nurture feelings of acceptance and inclusiveness (Gersick, Bartunek, & Dutton, 2000). Interaction with similar others can serve to reinforce positive self-perceptions and meet esteem needs (Baumeister & Leary, 1995) and reinforce the belief that a given set of characteristics is valuable.

While mutually rewarding exchanges produce positive returns, dysfunctional exchanges generate negative outcomes, such as increased interpersonal distress and low self-esteem (Scandura, 1998). Affiliation with dissimilar others may reduce feelings of connectedness and belongingness, and increase the probability an individual might perceive herself as an unwelcome outsider (Popielarz & McPherson, 1995; Higgins & Kruglanski, 1996). For these reasons, group members are likely to select interaction partners on the basis of mutual attraction, thereby maximizing the potential for positive returns.

Esteem needs and the desire for belongingness induce individuals to affiliate with people who possess similar characteristics. Byrne's (1971) laws of attraction suggests that people rate similar others as more attractive, and will take proactive steps to interact with similar others by joining professional organizations, religious groups, and social clubs that harbor homophilous members. This evidence further suggests that time spent with a network partner increases as a product of interpersonal attraction.

INFORMATION EXCHANGE AS FUNCTION OF ALLOCATED TIME

When two or more group members increase the amount of time spent together, it subsequently increases the probability they will use their time together to exchange information (Darr & Kurtzberg, 2000). Indeed, Burt (1987) and Coleman (1988) both note that cohesive groups tend to be comprised of individuals who interact frequently and typically have redundant information across network ties, suggesting that they have used their time together to share information (Regans, 2005). In fact, within the social networks literature, two individuals who interact frequently are presumed to possess equivalent information (Balkundi & Harrison, 2004; Granovetter, 1973). Furthermore, spending time with a partner creates the opportunity to build trust, which may explain why frequent interaction partners are less likely to filter or hoard information (Burt, 1992). Ultimately, an increase in the time two people spend together will subsequently increase the probability they will use their shared time to exchange information.

While successful information exchange is correlated with the opportunity to spend time with an interaction partner, it does not determine the type of information that is exchanged between two parties. Regardless of whether two individuals are surface-level or deep-level similar, initial information exchanges between them will tend to be dominated by a search for commonalities (Stasser, 1999). A focus on commonalities is a social norm that facilitates conversation through a focus on shared valuation, and can increase the level of comfort with an interaction partner (Boardman & Hargreaves-Heap, 1999). As initial interactions give way to repeated exchanges, a tendency to focus on shared characteristics may be diminished.

Deep-level similar group members may continue to focus on areas of shared interest during repeated interactions, but for group members who are deep-level dissimilar, the ability to sustain a conversation on a narrow margin of similarities is comparatively less, particularly over a prolonged number of interactions. Inevitably, two deep-level dissimilar individuals will be forced to address the broader domain of their unshared attributes. Furthermore, even the exchange of information on a shared topic may produce novel exchanges due to the presence of differing perspectives.

For example, in an academic setting, collaboration can occur within the same area of specialization within a department to create a deep-level similar exchange, or it may occur across departments to create a deep-level dissimilar exchange. Information exchanged within the same domain of the same discipline tends to be incorporated into the discipline's lexicon, leading to *incremental* developments in that field. The transfer of information across different domains can spark *radical* creativity by producing entirely new streams of thought and research.

The opportunity to glean unique knowledge from another group member is contingent upon many factors, and is subject to the effects of time-network maturity. The presence of interpersonal attraction increases the probability that two group members will spend time together, thereby increasing the opportunity for them to exchange information. Time spent with another group member is initially driven by shared surface-level characteristics. As a group's network structure matures over time, the basis of attraction is then driven by shared deep-level characteristics in the absence of any intervening variables. These theoretically derived tenets of human behavior in groups combine to form the foundation of our computer simulation. Our simulation explores how tie development and information exchange may differ as a product of network member characteristics, and how the intensity of these effects may evolve as the network matures. These assumptions of behavioral tendencies provide the foundation for a holistic evaluation of information exchange probabilities, which comprises the baseline model of similarity-based interaction and information exchange, as depicted in Fig. 1.

A NETWORKED-BASED PERSPECTIVE

The acquisition of information from group member interaction should result in enhanced group capabilities at multiple stages of the creative process: increasing the domain-relevant knowledge in the preparatory stage, facilitating the incubation phase, and empowering descriptive ability in the

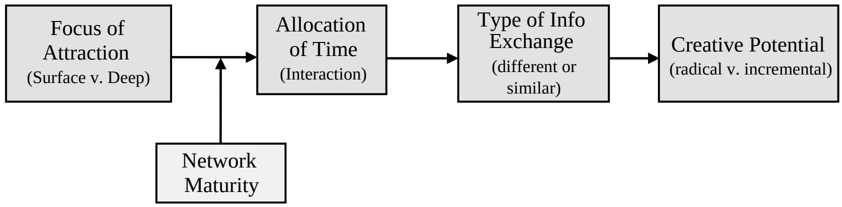

Fig. 1. Similarity-Based Interaction and Information Exchange Model.

elaboration phase of the creative process (Csikszentmihalyi & Sawyer, 1995). Social exchanges lead to an expanded knowledge base, resulting in a larger number of potential information combinations that are necessary for divergent thinking (Mumford & Gustafson, 1988). The social network literature suggests that certain types of dyadic connections provide the greatest utility during the creative process.

Exposure to nonredundant information is critical for group members to gain access to resources that can extend their range of available ideas and opportunities (McEvily & Zaheer, 1999). Weak ties, or connections between group members that are characterized by low levels of interaction, attachment, and exchange, provide access to a broad range of nonredundant information that facilitate the creative process (Granovetter, 1973; Perry-Smith & Shalley, 2003; Perry-Smith, 2006). Weak ties tend to develop between group members who experience some kind of impediment to strong attachment, such as geographic barriers, or more frequently, deep-level dissimilarity (McPherson et al., 2001). Information exchange between weak ties frequently creates exposure to nonredundant information that enhances domain-relevant knowledge (Glynn, 1996). Network theorists suggest the informational utility ascribed to weak ties occurs because weakly tied individuals are typically embedded within different networks and have access to unique information within those networks (Burt, 2004).

While weak ties are dominated by infrequent exchanges, strong ties are the logical opposite – they are connections dominated by high levels of interaction, attachment, and exchange (Granovetter, 1973). Strong ties provide emotional support and often play a critical role in the implementation stage of an innovation (Coleman, 1988). Strong ties tend to be transitive in nature, which leads to the development of close-knit network clusters in which an individual's strong ties also tightly bonded. Network theorists suggest that the presence of structural redundancy, or the development of close-knit network structures, is the primary reason the relative utility of information held by a strong tie is diminished (Granovetter, 1973, 1982).

While cohesive clusters tend to be homophilous on deep-level characteristics, they do not necessarily share the same surface-level characteristics. Research from the mid-twentieth century revealed a pattern of homophilous inbreeding, as strong ties were frequently homophilous on both deep- and surface-level characteristics such as age, gender, and ethnicity. However, the current demographic diversity and integration now present within both the community and the workplace has severely curtailed this pattern of homophilous inbreeding, producing strong ties that span gender and ethnic boundaries (McPherson et al., 2001). While age-based homophily is still quite common in nonfamilial strong ties, on the whole, surface-level characteristics have played a diminishing role in the determination of strong ties. Due to this reduction in homophilous inbreeding, it is no longer appropriate to use surface-level characteristics to predict deep-level characteristics, nor it is appropriate to use surface-level characteristics as a proxy for tie strength (Regans, 2005).

Since cohesive network clusters tend to be comprised of individuals who share the same values, beliefs, and perspectives (Coleman, 1990; McPherson et al., 2001), this deep value similarity may impede individuals' ability to gain exposure to novel ideas. In these clusters, individuals tend to be similar at a deep level, so perspectives will often be highly congruent as well as structurally redundant (Granovetter, 1973).

To better understand the social origins of creativity, it is critical to extend theory beyond a basic structural description of information redundancy, and explore how underlying characteristics of group members drive interaction and thereby determine network structure. In general, network theorists have tended to focus on structural factors – who is strongly or weakly tied to whom – as the primary determinants of information redundancy (Granovetter, 1973; Coleman, 1988; Perry-Smith & Shalley, 2003) rather than the underlying deep-level characteristics of network members. However, it seems likely that some of the redundancy associated with strong ties (and ascribed to network structure) is instead a product of interaction patterns that arise from attraction based on deep-level similarities. Likewise, the relative utility of nonredundant information supplied via weak ties may not result solely from network structure, but instead may reflect the exposure to unique perspectives held by deep-dissimilar individuals. The incorporation of deep-level characteristics in the network model suggest that a strong tie to someone who is deep-level dissimilar may produce the most powerful returns for individual creative potential, because it can lead to a steady stream of unique information that can facilitate highly divergent thought. This presents a logical conundrum, as this type of configuration (a strong tie between individuals who are deep-level dissimilar) is highly unlikely due to a proclivity for association with individuals who are deep-level similar.

THE PARADOX OF CREATIVITY

Since group members are unlikely to be attracted to dissimilar others, they are less likely to exchange information with dissimilar others. However, interactions with group members who are deep-level dissimilar may provide the greatest informational returns when highly novel output is desired. This tendency highlights an interesting paradox in the creativity literature: group members naturally will tend to spend time with those group members who may be least likely to facilitate radical creativity.

Research in social psychology (e.g., Byrne & Nelson, 1965) suggests that very dissimilar people are unlikely to interact and share information. However, the exchange of information with dissimilar others would greatly increase a group member's range of information, and thereby facilitate that group member's potential to generate highly unique or radical ideas – the type of ideas that are highly valued within knowledge-based organizations because they provide transformative opportunities for group or organizational growth. While interactions are more probable between similar group members, the potential for exchange of diverse information is comparatively less. As a result of the decreased potential for deep-similar group members to gain exposure to highly unique or different information via social interaction, the potential for radical creativity in the group is reduced.

Exposure to new perspectives decreases the potential for informational stagnation while simultaneously increasing the number of information recombinations available to group members (Barron & Harrington, 1981). As a result, radical creativity at the individual level may be enhanced, and members of a group may be more open-minded and tolerant of different ideas and perspectives as they are exposed to the value of unique information. This may have the overall effect of increasing both the quantity and quality of creative ideas generated within a group, because each member will have exposure to a broader base of ideas and information. Furthermore, this speaks to group creativity by exploring how a group of individuals may exchange ideas in an ad hoc fashion. To facilitate creative output at both the group and individual level, it is critical to understand how organizational variables might be managed to enhance the possibility of information exchange between deep-level dissimilar individuals who are more likely to possess diverse information. Thus, the remainder of this paper focuses on some of the network-based dynamics that precipitate the development of radical ideas, and explores some of the ways organizations might effectively manage the paradox of creativity.

An exploration into the role of attraction in the probability of information exchange reveals that attraction plays a paradoxical role in information exchange. While attraction between similar group members serves to increase the probability of information exchange, it decreases the probability of transferring novel information, subsequently decreasing the potential for highly creative output.

MODELING ATTRACTION-BASED INTERACTION EFFECTS ON CREATIVITY

Through the use of a computer simulation, we model the changes in information sharing that occur over time within a developing network. The simulation is based on three assumptions of human behavior: (1) the tendency of individuals to be attracted to similar others, (2) the tendency for individuals to spend time with attractive (i.e., similar) group members, and (3) the increase in information exchange between group members who spend time together.

Computer simulations are a means of empirical theorizing – a way to breathe concrete life into abstract arguments, and to follow the logic of theoretical assumptions to their natural conclusions. While simulations are not empirical proof, they enable researchers to understand a complex phenomenon by reducing it to its most basic form. As noted by Harrison White (1985), "It is the art of science to strip the fullest possible appreciation of events in context down to some core elements with those drawn from other contexts," and computer simulation provides a methodology for doing just that.

Computer simulations are used in many disciplines to explore a given phenomenon, and permit a greater understanding of theoretical arguments. Historically, the use of computer simulations has resided predominantly within the social and physical sciences (e.g., Axelrod, Riolo, & Cohen, 2002); however, this technique is occasionally utilized by organizational researchers to investigate the relationships between variables. For the most part, the use of simulations has been confined to macro studies, possibly due to their focus on large-scale phenomena. Cohen, March, and Olsen (1972) relied on a simulation in the development of the Garbage Can Model, while

Strang and Macy (2001) used a simulation to explore fads and adaptive practices. In addition, simulations have proved to be highly relevant to the study of diffusion of practice (Abrahamson & Rosenkopf, 1993). Although this technique is used less frequently in the organizational sciences, simulations can be highly useful when evaluating a phenomenon over time and/or exploring event probabilities.

To explore the effects of group member diversity on the development of social networks and emergent information flows, we utilized a *monte carlo* computer simulation to model information exchanges among members of a developing social network. Generalizing from the small groups' literature, the simulation is based on our theoretical assumptions about the causes of attraction, time spent, and information exchanges between dyadic pairs. Interactions were assessed using a group of 24 individuals. Contact between two members of the group was portrayed as a probabilistic event during each time period of the simulation, where the probability of interaction is determined by the joint characteristics of the two individuals and their pair-wise interaction history. A random number was generated for each pair of network members during each time period and compared to their pair-wise probability of interaction to determine whether the pair will interact during that time period. For those pairs of network members who interact during a particular time period, additional random numbers were generated to determine whether they exchange unique information.

The probability of initial contact between two network members was primarily determined by surface-level characteristic similarity ($s = x\%$) and less related to deep-level characteristic similarity ($d = y\%$, such that $x\% > y\%$ and $(x\% + y\%) = 100\%$). Once initial contact was made between two members of the network, the probability of interaction based on surface-level characteristic similarity decreases (by $z\%$) with each subsequent contact, while the probability of future interaction based on their deep-level characteristic similarity increases (by $z\%$) with each subsequent contact.

Group members were characterized as possessing one of two surface-level characteristics (either $A_{surface}$ or $B_{surface}$) and one of two deep-level characteristics (either A_{deep} or B_{deep}). The presence of a deep-level characteristic was not correlated with the presence of a surface-level characteristic. That is, independence between surface-level and deep-level characteristics was assumed, in keeping with evidence that surface-level and deep-level characteristics are often not correlated (McPherson et al., 2001).

Each member of the network was endowed with unique pieces of organizationally relevant information. When a dyad interacted, the probability that unique information was exchanged by either side during the interaction was *i*. Information exchanged between two deep-level similar group members facilitates incremental creative potential, while information exchange between two group members who are deep-level dissimilar facilitates radical creative potential.

Fig. 2 displays group information exchange tendencies that emerge from the basic assumptions outlined so far in this paper. These information exchanges speak to the relative potential for radical creativity that may be generated within a group over time. For each time period, this figure reveals

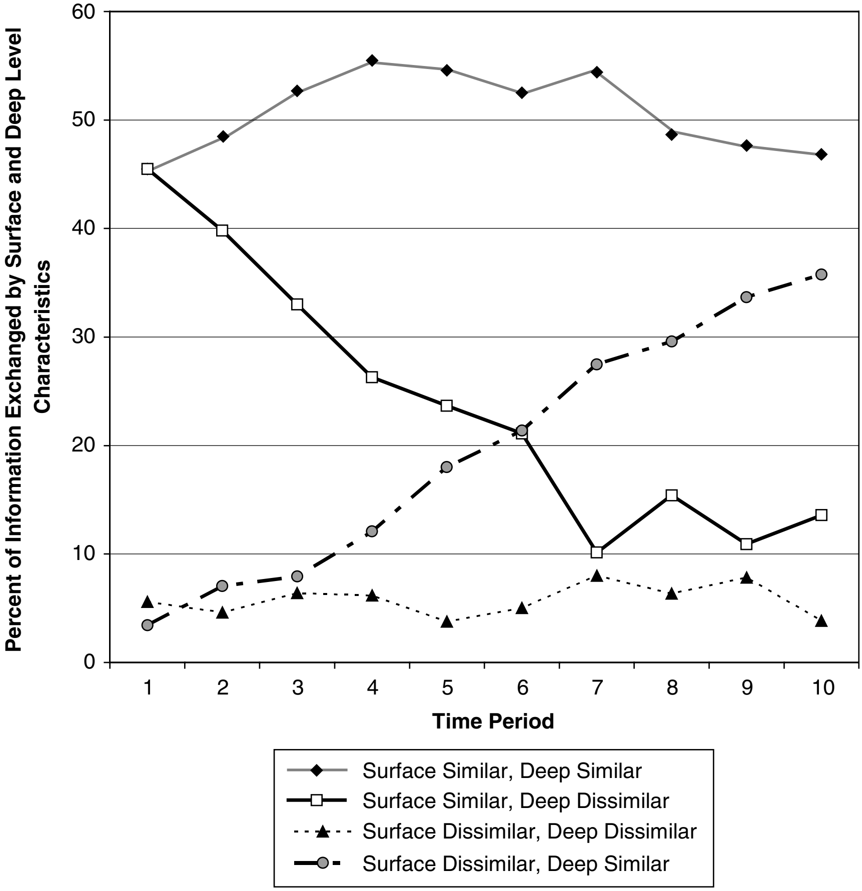

Fig. 2. Similarity-Based Interaction and Information Exchange Model Exchange Tendencies.

the proportion of information exchanges concentrated in each of the four interaction types (i.e., surface-similar and deep-similar, surface-dissimilar and deep-similar, surface-dissimilar and deep-dissimilar, surface-similar and deep-similar), with all numbers for a given time period totaling 100%. Presented statistics reflect the dyad-level exchange of unique pieces of information over 10 time periods of the simulation.

Fig. 2 reveals that initial information exchanges are highly contingent upon group member surface-level similarity; over time exchanges increasingly tend to occur between group members who are deep similar. The greatest proportion of information exchanges takes place between deep-level similar individuals, particularly at the simulation's end (i.e., as the network matures). Therefore, in this similarity-driven interaction model, the potential for information exchange between deep-level dissimilar individuals – where the potential for radical creativity should be greatest – is highest at the inception of the group or network, as approximately 50% of information exchanges occurred between deep-level dissimilar individuals during the early time periods of the simulation (e.g., at Time 1). By the end of the simulation, information exchanges between deep-level dissimilar group members comprise less than 20% of total information exchanged. This overall trend toward decreasing deep-level dissimilar exchanges indicates that the potential for socially-facilitated radical creativity declines over time when network interaction patterns are similarity driven. For organizations that value radical creativity, group tenure and network maturity may play a significant role in inhibiting the exchange of information that is vital to radical creativity, if the network structure is left to naturally develop along similarity-attraction lines.

PROXIMITY AS A COUNTERVAILING FORCE

The effects of proximity on social structure and friendship patterns were first observed by Festinger, Schachter, and Back (1950), who noted that the pattern of friendships among college students was partially contingent upon the physical layout of dormitory halls. Caplow and Forman's (1950) research further demonstrated the potential for weak ties development between students strongly premised on the relative proximity of dormitory rooms. Likewise, the arrangement of streets, seating, and office space are shown to influence the probabilities associated with dyadic interactions (Caldeira & Patterson, 1987; Sudman, 1988). However, it is not only the relative distance between two group members that determines proximal ties;

context also plays an important role in determining whether propinquity is actualized into contact. For example, the effects of proximal location in an office building would be strongest when the space was not shared by large numbers of people. As the number of group members sharing a space decreases, the effects of proximity are amplified.

Without proximity, the potential to develop a strong relational tie is severely curtailed. In fact, over 40% of individuals' ''frequent contacts'' live within a mile radius (Stallings, 1990). Even with the growth of technological communication, most friendship ties are local, suggesting that proximity may serve as a critical ''boundary condition'' (or moderator) of similarity-attraction effects. Furthermore, the development of social networks is related to geographic proximity, suggesting that interaction and information exchange occur most frequently among those people who share a physical space (Handcock, Raftery, & Tantrum, 2007).

Proximity can facilitate radical creativity by ensuring that individuals frequently interact with other group members outside their area of expertise (i.e., deep-level dissimilar others), as demonstrated by IDEO, the innovative firm studied by Hargadon and Sutton (1997). Refusal to assign cubicles and an emphasis on rotation creates a continual shift in the physical environment, facilitating exposure of individuals to all employees in the organization. This technique is credited for making connections across functional boundaries in the organization and spurring creativity that is so vital to the core business. Furthermore, the absence of closed offices encourages communication among employees by increasing opportunities for interaction.

Proximity may counteract similarity effects by altering interaction probabilities, thereby impacting the possibility of information exchange and ultimately emergent (radical) creative potential. The examination of proximity effects on group interaction patterns can facilitate a greater understanding of how organizations might manage the physical arrangement of group members to reduce the effects of similarity-driven exchange. Therefore, we simulated a proximity-driven model by ''positioning'' diverse group members in close proximity, thereby increasing the probability of interaction. This increased interaction likelihood may serve to disrupt the deep-level homophilous exchange patterns observed in similarity-driven networks.

Fig. 3 illustrates the impact of interaction probabilities on information exchange in a group that is governed entirely by proximity, with each group member having an equal probability of being situated next to deep-level dissimilar and deep-level similar others. (Neighboring group members were either surface- or deep-dissimilar, but not both. The next closest neighbors were dissimilar on both dimensions, while the most distant neighbors were

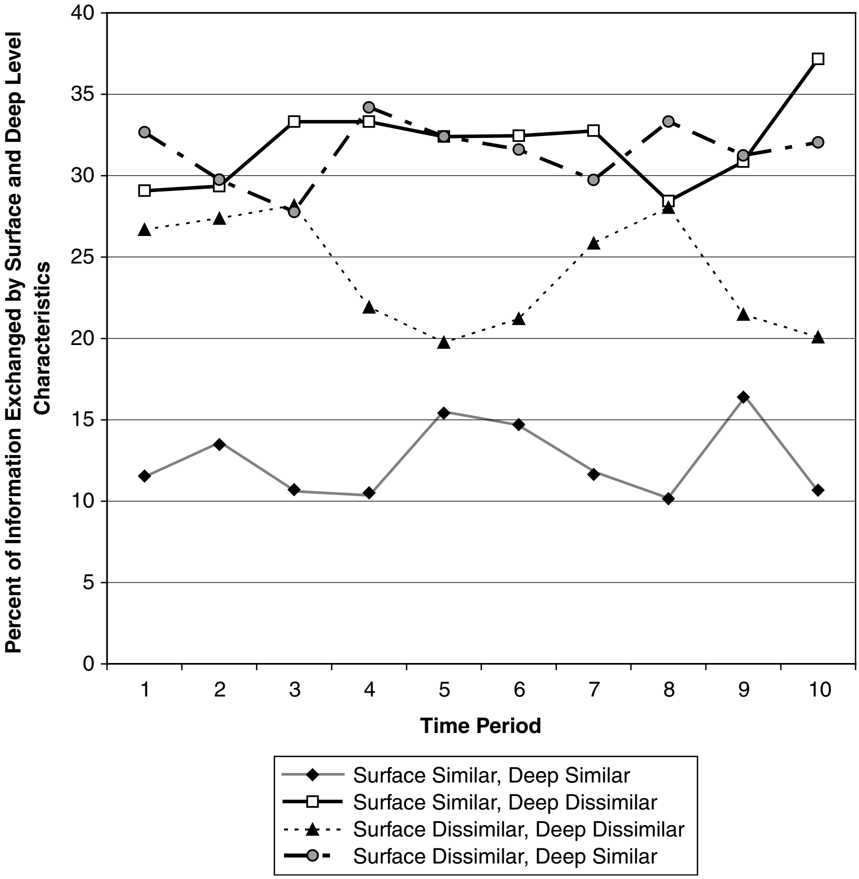

Fig. 3. Proximity-Based Interaction and Information Exchange Model Exchange Tendencies.

similar on both dimensions.) This model demonstrates the impact of proximity on information exchanges, when proximity is examined independently of similarity-driven interaction assumptions and tendencies. For this simulation, all group members were located in grid fashion, and the probability of information exchange between two group members was a decreasing linear function of the distance between them in the grid. As shown in Fig. 3, in this proximity-driven environment, information exchanges between deep-level dissimilar individuals were at least as likely as information exchanges between deep-level similar individuals.

In a network where interaction is proximity driven, there is a greater probability of information exchange between deep-level dissimilar individuals than in a similarity-driven network – especially so as the network matures. As a result, a comparatively higher potential for radical creativity is anticipated in a proximity-driven network. However, the proximity model does not incorporate natural human behavioral tendencies and interaction preferences (such as similarity attraction).

Fig. 4 illustrates the results of a third and final simulation, the result of combining the similarity-driven interaction model of Fig. 2 with the

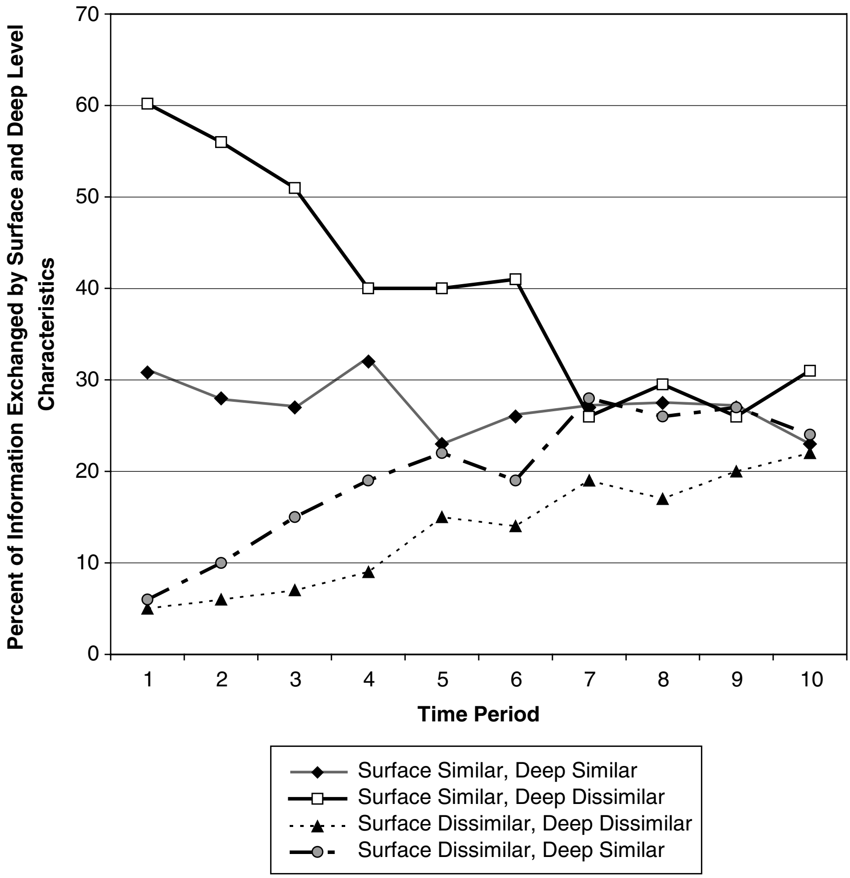

Fig. 4. Similarity- and Proximity-Based Interaction and Information Exchange Model Exchange Tendencies.

proximity-driven interaction model of Fig. 3, producing a third model of similarity-based interaction that is moderated by proximity.

The similarity and proximity interaction and information exchange model assesses the joint impact of the assumptions about similarity attraction with the influence of proximity on the potential for deep-level dissimilar interactions and information exchanges. The simulation reveals that information exchanges between deep-level dissimilar group members are approximately 2.5 times more likely to occur when the effects of similarity are moderated by proximity. Although proximity influences cannot completely overcome homophilous effects on interaction patterns and information exchange, they dramatically increase the potential for deep-level dissimilar exchanges. Therefore, the potential for radical creativity is much higher in this third model due to the greater exposure of group members to diverse information. In sum, the proactive management of proximity as a means to increase deep-level dissimilar interactions may be an effective way to increase information exchanges between deep-level dissimilar individuals, as shown by the model in Fig. 5.

The moderating role of proximity on similarity-driven information exchange, and the ability of proximity to increase information exchange between deep-level diverse individuals, has important implications for creative potential in organizations. Proximity may be used to increase the number of interactions between deep-level diverse individuals over time, subsequently increasing group members' access to unique information, and their potential for divergent thinking and radical creativity.

The results of this simulation also challenge the logic of "the strength of weak ties" (e.g., Granovetter, 1973). Weak ties are thought to be valuable for radical creativity because they provide access to diverse information (i.e., via contact with dissimilar others). But if the value of these weak ties is primarily derived from the diverse information they offer, then fully harvesting the value of these weak ties would most likely require developing

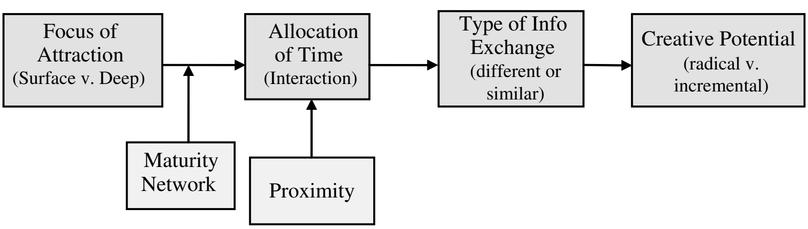

Fig. 5. Similarity- and Proximity-Based Interaction and Information Exchange Model.

them into stronger ones – i.e., increasing the frequency of interaction among deep-level dissimilar others in the network. The proactive management of proximity in groups and organizations offers an avenue for doing just that – creating strong ties among deep-level dissimilar others.

FURTHER CONSIDERATIONS

The computer simulations described in this paper assume independence between surface-level and deep-level characteristics. In some populations, surface-level and deep-level characteristics may be correlated, which would alter the emergent patterns of interaction and information exchange demonstrated here. A high correlation between surface-level and deep-level characteristics would increase the rate by which similarity-based network clusters formed, since initial (surface-similar) interaction partners would be more likely to be maintained over time. As a result of rapid clustering tendencies, the potential for information sharing between deep-level dissimilar individuals would be further reduced. This suggests that in populations with high correlation between surface-level and deep-level characteristics, the role of proximity is increasingly important due to its ability to disrupt homophilous interaction and information sharing, and thereby increase the potential for radical creativity.

A further limitation of this paper is its focus on equally proportioned groups and the subsequent exclusion of any analysis of the impact of minority proportions of group members. The presence of deep-level minority groups would decrease the potential number of deep-level dissimilar dyadic pairs, thus reducing the total possibility of deep-level dissimilar exchanges. Likewise, the presence of surface-level minority groups, and member awareness of their minority status, could increase cohesion in these factions, regardless of deep-level characteristics. Under these conditions, or when surface-level characteristics are highly salient or perceived as important by the group, these characteristics may operate as deep-level characteristics (Harrison, Price, & Bell, 1998; Harrison, Price, Gavin, & Florey, 2002) in terms of driving long-term attraction and interaction. The presence and impact of minority proportions on information exchange probabilities is an important extension to the implications we have developed in this paper.

In our theorizing, proximity was defined using physical or spatial measures; however, this definition may be too one-dimensional to provide a complete assessment of network tie development in modern organizations. Technology plays an increasingly important role in facilitating communication (e.g. Arnum, 2000), by permitting a large volume of rapid information exchange and easy access to a large social group, regardless of physical location. Therefore, the notion of proximity as spatial location may be overly simplistic, lacking the ability to capture the dynamics of the technological environment. Both the salience of a target and ease of communication with that target combine to form a psychological or perceptual state of proximity (Rockmann, Northcraft, & Pratt, 2007). An exploration of proximity in the virtual environment could augment our understanding of what it means to "be close" to other group members – even physically distant ones. Furthermore, the increased documentation that characterizes virtual interactions results in the production of a recorded information exchanges (Lin & Chen, 2006). These types of interactions – unlike face-to-face exchanges – may be repeatedly accessed, which has important implications for creative development. Since the meaning of proximity and interaction in technologically mediated teams differs from the face-to-face groups discussed in this paper, further analysis is necessary to draw conclusions about the nature of incremental and radical creativity in virtual groups. Certainly, technology offers the possibility of increasing the "psychological" proximity of otherwise dispersed group members, so it may not be necessary to physically colocate dissimilar group members to facilitate their frequent interaction as long as they are psychologically close, and salient, to each other. On the other hand, technology may also make it easier for individuals to override proximity's moderating effects on similarity attraction by increasing group members' access to similar others – even geographically dispersed ones.

As illustrated by the role of virtual communication in the reduction of barriers, individuals can be important agents in the reduction of physical impediments to communication, behaving proactively to shape their physical environment to maximize contact with attractive partners (Byrne, 1971). For example, in the absence of assigned seating arrangements in lecture halls (or at conference dinners), clusters of (deep-level similar) friends tend to sit together. In organizations where offices are interchangeable cubicles, and networks clusters have reached maturity, one would expect to find clusters dominated by deep-level similarity. While an individual's ability to exercise power over their physical environment may differ according to organizational norms or member status, it should be recognized that individuals are autonomous and proactive agents, shaping their physical environment. The tendency for homophily to influence proximity – and thus possibly disrupt the countervailing force of proximity on homophily – is captured by an additional modification to our theoretical model, shown in Fig. 6.

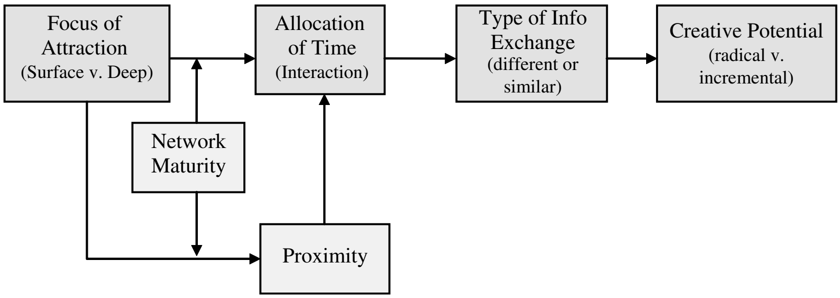

Fig. 6. Similarity- and Proximity-Based Interaction and Information Exchange (Including Effects of Attraction on Proximity).

Proximity facilitates exposure to both the ideas and information held by others, so the extent of organizational control over proximity is critical. With this in mind, it is important to reiterate that this paper's primary focus is on the probability of *connecting* information sources together. This paper does not address how the dynamics of shared characteristics (or lack thereof) will influence the probability of an information exchange. In essence, we explore what might happen within a group when two (dissimilar) information sources connect. We do not address how individual characteristics, such as deep-level diversity, might facilitate or impede the information exchange process. As a result, the focus of this paper is on *creative potential within a group*, rather than creativity in a more concrete form. The mere exposure to new ideas does not necessitate the integration or use of those ideas in the creative process; therefore, the willingness to consider and assimilate diverse perspectives is essential to translate information received from creative potential into creative output. While other individual biases, group conflict, and organizational norms play a role in the utilization of information (Gilson & Shalley, 2004), these processes are also beyond the scope of the paper. The sole focus on creative potential in this paper permits the freedom to independently investigate how deep-level characteristics might impact creativity.

The focus on creative potential has permitted a unique analysis of network relationships. To date, most of the literature on network theory has predominantly relied on a structural redundancy framework to explain the quality of information flow among ties (Granovetter, 1973; Perry-Smith, 2006). However, we have suggested that the presence of similar characteristics among strong ties (McPherson et al., 2001), and a tendency to value similar information, may compound the information stagnation issue that emerges from structural redundancy, ultimately hindering creative potential.

The potential to develop strong ties among group members who are deep-level dissimilar may provide the greatest contribution to creative potential by ensuring a steady supply of unique information.

CONCLUSIONS

Creativity plays an increasingly important role in an organization's ability to both develop and sustain a competitive advantage in today's knowledge-based economy (Kim & Lee, 2006). For this reason, a greater understanding of the organizational dynamics that might facilitate creativity is increasingly relevant. Broadly, there are two categories of creativity: radical and incremental. While both types of creativity can provide value and utility to an organization, radical creativity is often highly prized due to is broad developmental capabilities.

The arguments presented in this paper build on the social model of creativity by using a network-based perspective to evaluate tie formations within a group, the resulting information exchanges, and the ramifications for the group's creative potential. A computer simulation demonstrated the normally creativity-disruptive effects of similarity attraction on network tie development and information sharing. The results of the simulation suggest that the proactive management of proximity may act as countervailing force against similarity effects by promoting more creativity-enhancing network ties between members who are deep-level dissimilar. As a result, organizations can manipulate group member proximity to increase the probability of interaction and information exchange between deep-level dissimilar group members. Ultimately, this could increase the potential of groups (and organizations) to generate a larger number of radically creative ideas.

REFERENCES

Abrahamson, E., & Rosenkopf, L. (1993). Institutional and competitive bandwagons. *Academy of Management Review*, *18*, 487–517.

Amabile, T. M. (1983). *The social psychology of creativity*. New York: Springer-Verlag.

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.

Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review*, 77–87.

Arnum, E. (2000). Year-end 1999 mailbox report. *Messaging Online*. Retrieved September 30, 2008. Web site: http://www.messagingonline.net/mt/html/mt031400.html

Axelrod, R., Riolo, R. L., & Cohen, M. D. (2002). Beyond geography: Cooperation with persistent links in the absence of clustered neighborhoods. *Personality and Social Psychology Review*, *6*(4), 341–346.

Balkundi, P., & Harrison, D. (2004). Networks, leaders, teams and time: Connections to viability and performance. *The Academy of Management best paper proceedings*, New Orleans.

Balkundi, P., Kilduff, M., Michael, J., Barsness, Z., & Lawson, L. (2007). Demographic antecedents and performance consequences of structural holes in work teams. *Journal of Organizational Behavior*, *28*, 241–260.

Barron, F., & Harrington, D. M. (1981). Creativity, intelligence and personality. In: M. R. Rosenzweig & L. W. Porter (Eds), *Annual review of psychology* (Vol. 32, pp. 439–476). Palo Alto, CA: Annual Reviews.

Baumeister, R., & Leary, M. F. (1995). The need to belong: Desire for interpersonal attachments as fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529.

Bell, S. T. (2007). Deep-level composition variables and predictors of team performance a meta-analysis. *Journal of Applied Psychology*, *92*(3), 595–615.

Boardman, A. E., & Hargreaves-Heap, S. P. (1999). Network externalities and government restrictions on satellite broadcasting of key sporting events. *Journal of Cultural Economics*, *23*, 167–181.

Burt, R. S. (1976). Position in networks. *Social Forces*, *55*, 93–122.

Burt, R. S. (1987). Social contagion and innovation: Cohesion versus structural equivalence. *American Journal of Sociology*, *92*, 1287–1355.

Burt, R. S. (1992). *Structural holes*. Cambridge, MA: Harvard University Press.

Burt, R. S. (2004). Structural holes and good ideas. *The American Journal of Sociology*, *110*(2), 349–400.

Byrne, D. E. (1971). *The attraction paradigm*. New York, NY: Academic Press.

Byrne, D. E., & Nelson, D. (1965). Attraction as a linear function of proportion of positive reinforcements. *Journal of Personality and Social Psychology Bulletin*, *4*, 240–243.

Caldeira, G. A., & Patterson, S. C. (1987). Political friendship in the legislature. *Journal of Politics*, *4*, 953–975.

Caplow, T., & Forman, R. (1950). Neighborhood interaction in a homogeneous community. *American Sociological Review*, *15*, 357–366.

Clark, R. W. (1972). *Einstein: The life and times*. New York: Avon Books.

Cohen, M. D., March, J. G., & Olsen, J. P. (1972). A garbage can model of organizational choice. *Administrative Science Quarterly*, *17*(1), 1–25.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, *94*, S95–S120.

Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.

Cropley, A. (2006). In praise of convergent thinking. *Creativity Research Journal*, *18*(1), 291–404.

Csikszentmihalyi, M., & Sawyer, K. (1995). Creative insight: The social dimension of solitary moment. In: R. J. Sternberg & J. E. Davidson (Eds), *The nature of insight* (pp. 329–363). Cambridge, MA: MIT Press.

Darr, E. D., & Kurtzberg, T. R. (2000). An investigation of partner similarity dimensions on knowledge transfer. *Organizational Behavior Human Decision Processes*, *82*(1), 28–44.

Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical study. *Management Science*, *32*(4), 1422–1433.

Festinger, L., Schachter, S., & Back, K. (1950). *Social pressures in informal groups: A study of human factors in housing*. New York: Harper.

Gersick, C. J., Bartunek, J. M., & Dutton, J. E. (2000). Learning from academia: The importance of relationships in professional life. *Academy of Management Journal*, *43*, 1026–1044.

Gilson, L. L., & Shalley, C. E. (2004). A little creativity goes a long way: An examination of teams' engagement in creative processes. *Journal of Management*, *30*, 453–470.

Glynn, M. A. (1996). Innovative genius: A framework for relating individual and organizational intelligences to innovation. *Academy of Management Review*, *21*, 1081–1111.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*, 1360–1380.

Granovetter, M. S. (1982). The strength of weak ties: A network theory revisited. In: P. Marsden & N. Lin (Eds), *Social structure and network analysis* (pp. 105–129). Beverly Hills, CA: Sage.

Griffith, W., & Veitch, R. (1974). Preacquaintance attitude similarity and attraction revisited: Ten days in a fall-out shelter. *Sociometry*, *37*, 163–173.

Guilford, J. P. (1950). Creativity research: Past, present, and future. *American Psychologist*, *5*, 444–454.

Handcock, M. S., Raftery, A. E., & Tantrum, J. M. (2007). Model-based clustering for social networks. *Royal Statistical Society: Series A*, *170*(2), 301–354.

Hargadon, A. (2003). *How breakthroughs happen. The surprising truth about how companies innovate*. Boston, MA: Harvard Business School Press.

Hargadon, A., & Sutton, R. I. (1997). Technology brokering and innovation in a product development firm. *Administrative Science Quarterly*, *42*, 716–749.

Harrison, D. A., Price, K. H., & Bell, M. P. (1998). Beyond relational demography: Time and effects of surface- and deep-level diversity on work group cohesion. *Academy of Management Journal*, *41*, 96–107.

Harrison, D. A., Price, K. H., Gavin, J. A., & Florey, A. T. (2002). Time, teams, and task performance: Changing effects of surface- and deep-level diversity on group functioning. *Academy of Management Journal*, *45*, 1029–1045.

Higgins, E. T., & Kruglanski, A. E. (1996). *Social psychology: Handbook of basic principles*. New York: The Guilford Press.

Huckfeldt, R., & Sprague, J. (1995). *Citizens, politics and social communication: Information and influence in an election campaign*. New York: Cambridge University Press.

Hudson, L. (1967). *Contrary imaginations; A psychological study of the English schoolboy*. Harmondsworth: Penguin.

Huston, T. L., & Levinger, G. (1978). Interpersonal attraction and relationships. In: M. R. Rosenzweig & L. W. Porter (Eds), *Annual Review of Psychology*, *29*, 115–156.

Ibarra, H. (1995). Race, opportunity and diversity of social circles in managerial managers' networks. *Academy of Management Journal*, *38*(3), 673–703.

Kaluzny, A. D., Gentry, J. T., & Veney, J. E. (1974). Innovations of health services: A comparative study of hospitals and health departments. *Millbank Quarterly*, *52*, 51–58.

Kim, S., & Lee, H. (2006). The impact of organizational context and information technology on employee knowledge-sharing capabilities. *Public Administration Review*, *66*(3), 4–23.

Lawrence, B. S. (1997). The black box of organizational demography. *Organization Science*, *8*, 1–22.

Lazarsfeld, P. F., & Merton, R. K. (1954). Friendship as a social process: A substantive and methodological analysis. In: M. Berger (Ed.), *Freedom and control in modern society* (pp. 8–66). New York: Van Nostrand.

Lin, B., & Chen, C. (2006). Fostering product innovation in industry networks: The mediating role of knowledge integration. *International Journal of Human Resource Management*, *17*(1), 155–173.

Louch, H. (2000). Personal network integration: Transitivity and homophily in strong tie relations. *Social Networks*, *22*, 45–64.

Marsden, P. V. (1987). Core discussion networks of Americans. *American Sociological Review*, *52*, 122–313.

McEvily, B., & Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic Management Journal*, *20*(12), 1133–1156.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *21*, 415–444.

Miner, F. C. (1984). Group versus individual decision making: An investigation of performance measures, decision strategies, and process losses/gains. *Organizational Behavior and Human Performance*, *33*, 112–124.

Mizra, B. (2008). Organizational change starts with individual employees. *HR Magazine*, *53*(12), 31–33.

Monge, P. R., Cozzens, M., & Contractor, N. S. (1992). Communication and motivational predictors of the dynamics of organizational innovation. *Organization Science*, *3*, 250–274.

Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological Bulletin*, *103*, 27–43.

Munson, F. C., & Pelz, D. C. (1979). *The innovating process: A conceptual framework*. Working paper, University of Michigan.

Nemeth, C. J., Personnaz, M., Personnaz, B., & Goncalo, J. A. (2004). The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology*, *34*, 365–374.

Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, *39*, 607–634.

Paulus, P. B. & Yang, H. C. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes*, *82*(1), 76–87.

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, *49*, 85–101.

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, *28*, 89–106.

Popielarz, P., & McPherson, J. M. (1995). On the edge or in between: Niche position, niche overlap, and the duration of voluntary memberships. *American Journal of Sociology*, *101*, 698–720.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, *22*, 1–24.

Regans, R. (2005). Preferences, identity, and competition: Predicting tie strength from demographic data. *Management Science*, *51*(9), 1374.

Regans, R., Zuckerman, E. W., & McEvily, B. (2004). How to make the team: Social networks vs demography as criteria for designing effective teams. *Administrative Science Quarterly*, *49*, 101–113.

Rockmann, K., Pratt, M. G., & Northcraft, G. B. (2007). Divided loyalties: Determinants of identification in inter-organizational teams. *Small Group Research*, *38*(6), 725.

Scandura, T. A. (1998). Dysfunctional mentoring relationship and outcomes. *Journal of Management*, *24*(3), 449–467.

Stallings, W. (1990). *Local networks*. New York: MacMillan Publishing Company.

Stasser, G. (1999). The uncertain role of unshared information in collective choice. In: L. Thompson & J. Levine (Eds), *Shared knowledge in organizations* (pp. 49–69). Mahwah, NJ: Erlbaum.

Strang, D., & Macy, M. W. (2001). In search of excellence: Fads, success stories, and adaptive emulation. *American Journal of Sociology*, *107*, 147–182.

Sudman, S. (1988). Experiments in measuring neighbor and relative social networks. *Social Networks*, *10*, 93–108.

Thompson, J., Miller, T., Krantz, A., & Thomas, T. (2008). Six sigma engages physicians in achieving strategic performance improvement at OSF Saint Francis Medical Center. *Global Business and Organizational Excellence*, *23*(3), 6–15.

Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review*, *61*(4), 674.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, *42*(1), 35–67.

White, H. (1985). Agency as control. In: J. Pratt & R. Zeckhauser (Eds), *Principals and agents: The structure of business* (pp. 204–204). Boston, MA: Harvard Business School Press.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *19*, 293–321.

GROUP SPLITS AND CULTURE SHIFTS: A NEW MAP OF THE CREATIVITY TERRAIN

Katerina Bezrukova and Jayaram Uparna

ABSTRACT

In this chapter, we develop a theoretical model of group splits, culture shifts, and creativity in diverse groups. This model explains how the strength of informational faultlines can elicit a culture shift from a desired to an actual culture of creativity in a team, which then might differentially influence team creativity and group performance. We further argue that subgroup support and team creative efficacy may enhance the interaction of informational faultlines with a desired culture of creativity to facilitate the shift toward an actual culture of creativity. We also discuss future research directions and practical implications for stimulating creative behaviors in organizations.

INTRODUCTION

At the end of the last century, Apple Inc. felt a need for a new, creative product that would reestablish itself as the market leader in innovation. Seizing upon the creative idea of a portable and versatile music player,

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Apple actualized its desire for creative products and developed the iPod, now regarded as the pinnacle of customer product innovation (Prahlad & Krishnan, 2008; Schlender, 2005). This *shift* of Apple Inc. from a company that made stylistic computer products to an organization that dealt with auditory innovation, using collaboration from diverse teams all around the world is an oft-cited meme in the business world (Peterson, 2007). The introduction of other products such as iMac and iPhone has demonstrated that these creative outcomes were unlikely a fluke (Ogle, 2007; Schlender, 2005; Wozniak & Smith, 2006) but represented a major shift in an organization toward a more creativity-centered culture. Following other researchers who pointed to contextual factors (Amabile, Conti, Coon, Lazenby, & Herron, 1996) as playing important roles in fostering creativity, we believe that a cultural perspective may help better understand how creativity emerges in organizations. Building on Amabile's (1988) conceptualization of creativity, we define creativity as the *development* of new and original ideas or solutions, whereas innovation as the successful *implementation* of creative ideas, processes, and products (Amabile, 1988).

Furthermore, this breakthrough may not have been possible if not for Apple's exceptionally "*diverse* technological biosphere" (Grossman, 2005) that might have helped facilitate this successful transformation from a state of desire to an actual culture of creativity. Hence, it is not surprising that the company has been cited among the most aggressive with managing diversity initiatives (Grossman, 2005). It views diversity as a competitive issue and a top-down initiative that requires an overhaul in corporate culture as well as dedicated personnel and resources to help the company attract, nurture, and develop top talent. This strategy is based on the idea that teams with diverse employees can bring divergent tastes and approaches to the quality or configuration of the product (Caves, 2000). By including people of diverse backgrounds and differing viewpoints, a combination of elaborate explanations, experiences, and expertise may ignite the creative spark within a group (Ancona & Caldwell, 1992; Austin, 1997; McLeod, Lobel, & Cox, 1996; Nemeth, & Ormiston, 2007; Perretti & Negro, 2007; Thornburg, 1991; West, 2002a, 2002b). The key is that group members' support for different viewpoints and creative ideas may become normalized and eventually develop into the creative culture of the group. Thus, the focus of this chapter is to understand *how* group composition and, more specifically, diversity may help facilitate a culture shift from a desired to an actual culture that values and encourages creativity in team settings.

One way to look at diversity is to think about it in terms of faultlines. Faultlines form when group members' demographic characteristics (e.g., functional background, work experience, education) come into alignment and divide a group into relatively homogeneous subgroups (Lau & Murnighan, 1998). For instance, a faultline exists when all the engineers in a team are computer science majors and all the sales employees have a marketing degree. Although prior research suggests that the resulting faultline subgroups would be inherently detrimental for group creativity (Lau & Murnighan, 1998; Pearsall, Ellis, & Evans, 2008), in accord with recent theorizing (see Nishii & Goncalo, 2008), we argue that faultlines may create a condition for creative sparks to ignite in diverse groups and to help solidify a culture of creativity. Unlike prior research that has primarily focused on the type of faultlines that form along demographic lines (e.g., Lau & Murnighan, 1998; Li & Hambrick, 2005; Nishii & Goncalo, 2008), our emphasis is on the type of faultlines that form along informational and most job-related lines (e.g., tenure, function, education). We believe that this type of faultlines will be most relevant for creative processes in teams. We further propose that a culture shift will occur when a group's desire and need for creativity is well recognized, accepted, and manifested in actual creativity culture and that informational faultlines will facilitate this process. As Perretti and Negro (2007) further noted, group composition may induce exploration and creativity, yet the resulting product may not necessarily achieve commercial success. We follow their suggestion to develop the links across various dimensions of group performance, and consider creative as well as practical performance of diverse groups.

CULTURE OF CREATIVITY

Scientific inquiry into creativity has pointed to contextual factors such as the social environment (Amabile et al., 1996) and, more specifically, organizational culture (Chatman, Polzer, Barsade, & Neale, 1998; DeFillippi, Grabher, & Jones, 2007) as playing important roles in its advent. For instance, Amabile et al. (1996, p.1155) pointed out that "the social environment can influence both the level and frequency of creative behavior." Hunter, Bedell, and Mumford (2007) as well as Schepers & van den Berg (2007), Boerner and Gebert (2005), and Haner (2005) also indicate the behavioral impacts of organizational norms on the emergence of creativity in groups. As such, research on culture has attracted a lot of attention, employing a wide array of theoretical interests, methodological tools and definitions to study it. Although some found it highly problematic (Alvesson, 1993; Martin, 1992), others have attempted to conceptualize it as a measurable characteristic of an organization (Gregory, 1983; O'Reilly & Chatman, 1996; Sackmann, 1992). Yet, neither scholars nor practitioners can afford to ignore culture given the recent trends toward more decentralized organizational groups and increasingly multicultural work life. In exploring how a cultural perspective may help better understand the emergence of creativity in organizations, we follow a research tradition that defines culture as a form of social control that clarifies which behaviors and attitudes are more or less appropriate for members to display (e.g., O'Reilly & Chatman, 1996). More specific to the management field and consistent with Barney (1986), we conceptualize culture as shared values, beliefs, assumptions, and symbols that define the way a firm conducts its business.

Research on culture emphasizes the importance of taking into account the content of cultures, and sequentially, the norms and the behaviors they support, as they may vary widely across organizations (Bettenhausen & Murnighan, 1991; Jehn, 1994). For example, culture may reflect preferred ways to perform individual and group tasks such as being creative, task-oriented, or career-oriented (Jehn, 1994; Jehn, Chadwick, & Thatcher, 1997; O'Reilly, Chatman, & Caldwell, 1991). Of particular interest here is the culture of creativity which refers to the extent to which employees value and encourage the development of novel ideas, challenge traditional ways of doing things, learn from others, and believe that creativity is important for their group (adapted from Van Der Vegt, Van De Vliert, and Huang, 2005). There has been some research showing how cultural tenets such as openness or closedness can directly affect the quality of creative work achieved (cf. Gebert & Boerner, 1999; Shalley, Gilson, & Blum, 2000). Strong cultures that reward information sharing and encourage the expression of creative ideas have been theorized to influence creativity (Flynn & Chatman, 2001). Others have found that individualistic cultures that encourage divergent thinking could be vital for creativity (Goncalo & Staw, 2006). Evidence has also suggested that cultures that provide support and encourage risk taking can enhance creativity (Amabile, 1988; Burnside, 1990; Nystrom, 1990). Unlike this past research that mostly focused on how various contents of organizational culture may influence creativity, we shift our focus toward understanding the antecedent conditions of a culture of creativity and its emergence in workgroups.

Largely missing in the prior work on organizational culture is its extension to group culture (with a few exceptions, Chatman & Spataro, 2005; Jehn, 1994; Sackmann, 1992). The dominant paradigm in culture research has emphasized the homogeneous and undivided nature of culture rather than its divisive potential (Gregory, 1983; Sackmann & Phillips, 2004). It is, in fact, problematic as culture is an emergent phenomenon and is flexible enough to form additional potentially evolving subcultures (Adkins & Caldwell, 2004). Many workgroups are now almost entirely self-managing and with the intensity of work and the amount of time spent together as a group, they provide the opportunity for subgroup cultures to emerge (Sackmann, 1992). These cultures offer a common sense of identity that becomes group-specific and has a potential to influence members' behavior (Earley & Mosakowski, 2000). Group culture is defined as the extent to which group members have consensus on values, norms, and appropriate behaviors related to work (adapted from Chatman & Jehn, 1994; Mannix, Thatcher, & Jehn, 2001; Rousseau, 1990; Triandis & Suh, 2002). Group culture is an important variable to look at as it refers to group members' fundamental beliefs regarding the desirability of behavior choices (Enz, 1988; Rokeach, 1973). In this paper, we, therefore, focus on *group* culture that revolves around an important aspect of group work, *creativity*.

Culture Shifts

Research, which primarily views organizational culture as a relatively *stable,* structured set of symbolic meanings shared by a group of people, has contributed significantly to our understanding of organizational processes (Audia & Goncalo, 2007; Caldwell & O'Reilly, 2003; Flynn & Chatman, 2001; O'Reilly & Chatman, 1996), especially in the area of cross-cultural comparisons (Goncalo & Staw, 2006). However, there has been some evidence in literature supporting the idea of organizational culture's changing nature. For instance, research within evolutionary and socio-cultural psychology has discussed evolvability of culture and has perceived culture as being constantly in flux, proposing a number of evolutionary models of cultural change (Kashima, 2002; Sterelny, 2006). Related research in social psychology has also demonstrated how interactions among individuals may lead to norm change over time (MacNeil & Sherif, 1976; Sherif & Sherif, 1969). For instance, social pressures such as conformity or arbitrary events resulting from interactions (e.g., a spontaneously uttered colloquialism becoming a group "motto" or "theme") could lead to enculturation and facilitate such change (MacNeil & Sherif, 1976; Sherif & Sherif, 1969). Similarly, organizational research has shown how transformational leadership can stimulate cultural change and result in a culture shift toward quality improvement values and beliefs (Waldman et al., 1998).

Although this research asserts that it is difficult to change culture (Dombrowski et al., 2007), a new culture of creativity *can be* developed and become sustainable if certain key elements (e.g., flexibility, collaboration) are embedded in the culture (Dombrowski et al., 2007; Zairi & Al-Mashari, 2005).

Related research on culture change in organizations has theorized that organizational culture shifts are context based and thus, changes in deep-level member values are possible only when the firms seek employee buy-in, and member-organization values align (Ogbonna & Wilkinson, 2003). Evidence mostly indicates that change in an organization toward a more creativity-centered culture can be successful only when employees desire it, see some reward structure (even vague goals), and believe in the value of this change (Causon, 2004; Hesselbein, 2008; O'Hara & Sternberg, 2000; Rodrigues, 2005). All these, however, have mainly considered involuntary change (which can result in negative reactions such as member opposition, Ogbonna & Wilkinson, 2003), and have rarely looked at change brought about by volition of the groups themselves (as we study in this chapter). Associated research has emphasized the role of organizational identity and its emergent state in the context of corporate spin-offs and other forms of organizational change (e.g., Corley & Gioia, 2004; Fiol, 2002; Gioia, Schultz, & Corley, 2000). This research has also added many important insights into how both planned and unplanned organizational identity change might occur through changes in labels (e.g., "we are a creative company") and shared meanings underlying labels (e.g., "cutting-edge scientific research"). In this paper, rather than focusing on identity shifts as relevant to the question of how creativity is recognized (Adarvers-yorno, Postmes, & Haslam, 2006), we turn our attention to another socially constructed phenomena – culture defined as a form of social control that can influence members' focus of attention, behavior, and commitment (Flynn & Chatman, 2001).

We further focus on exploring the dynamic nature of team culture and, in response to Bain, Mann, and Pirola-Merlo's (2001) call, look at the relationship between various states of *culture of creativity* and group creativity. We continue this "temporal" tradition in research on culture and draw on both Choi's (2004) and Young and Parker's (1999) work that differentiates between desired and actual ideals and views culture as malleable and evolving. According to the authors, when such desired cultural ideals transmute into actuality, a culture shift is said to have occurred. We extend this prior work and examine the process by which a desired culture of creativity changes into an actual culture of creativity in diverse groups. A desired culture of creativity reflects a group's need and desire for creativity and innovative ways of doing things and belief in the value of creativity (adapted from Choi, 2004). An actual (or current) culture of creativity refers to the extent to which employees accept, value, and encourage the development of novel ideas and believe that creativity is important for their group (often in the form of deeply held assumptions, meanings, and beliefs, Martin, 2002; Schein, 1992). We further argue that a culture shift will occur when a group's desire and need for creativity is well recognized, accepted, and manifested in an actual group culture of creativity.

We derive our propositions based on multiculturalism theory, which argues that individuals have certain ideals and views about distinct cultures that may be expressed (actual values) or latent (desired values) (Burrell & Morgan, 1979). They use these ideals and views to interpret and form a framework of assumptions about the world. The body of theory and research further suggests that group members with compatible levels of a need for valuing creativity (desired culture) will satisfy this need by recognizing and solidifying it in their actual group culture. They will then be more likely to process new information that might change their views and interpret organizational events similarly. When the desire to achieve goals that are congruent with the organizational goals arises in a team, research suggests that there will be more efforts toward the actualization of these intended cultural changes (Meglino, Ravlin, & Adkins, 1989; Sørensen, 2002). In addition, within group contexts, individuals have been found to offer fewer ideas because of feelings of inhibition and fear of being negatively evaluated by group members (Camacho & Paulus, 1995; Diehl & Stroebe, 1987). However, when members more openly express the desire to change toward solutions that are more creative, their ideas may no longer be stifled and social inhibition may be reduced; this ultimately may manifest itself in steps toward an actual group culture of creativity.

The body of literature also suggests that when individuals recognize their desires, they make choices toward creativity (desired culture) and often set goals and engage in behavior to achieve these creative targets as a team (akin to actual culture) (Drazin, Glynn, & Kazanjian, 1999; Litchfield, 2008). This is in line with Zajonc's (1968) classic "Mere Exposure Effect," theorizing that the very presence of a charged atmosphere congruent with one's desires, values, and beliefs may act as a powerful stimulant for action toward achieving those desires. Thus, groups believing in the value of creativity may galvanize action among its members (Stenmark, 2005), shifting their desired culture into an actual culture of creativity. Groups also tend to make more extreme judgments and take riskier decisions (allowing for more creativity) than individuals (e.g., Cecil, Cummings, & Chertkoff, 1973; Wallach, Kogan, & Bem, 1962). We argue that in groups with high levels of a desired culture of creativity, group polarization might occur toward creativity-centered in-group norms (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Consistent with social categorization theory (Tajfel & Turner, 1986), members' beliefs and values can shift toward a most prototypical norm (creativity) resulting from the self-categorizations that create a common identity in a group. Group polarization might be partly responsible for that "shift" from a desired to an actual culture of creativity, where such riskier, creative actions become acceptable and normalized. Thus, we expect the following main effect:

Proposition 1 (P1). A desired culture of creativity will be associated with an actual culture of creativity.

SHAPING CREATIVITY CULTURE: THE ROLE OF GROUP DIVERSITY

Organizational literature suggests that group creativity is partially a function of both contextual (e.g., organizational culture) and structural (e.g., group composition) characteristics of a group (Bain et al., 2001; Chatman et al., 1998). This is because lone scientists working in isolated environments are no longer the mainstay in creative industries. Nowadays, products, solutions, and services are designed by collaborations and groups of people who regularly brainstorm to tap their creative spirit (Locke et al., 2001; Wuchty, Jones, & Uzzi, 2007). This trend toward group-based work is because when people meet as a team to discuss their tasks, there is a chance for minds to engage in a more detailed, collective exploration of the matter at hand (Paulus, 2000a; Pirola-Merlo & Mann, 2004; Taggar, 2001). Unsurprisingly, companies often require teams of diverse skilled and specialized workers who bring divergent tastes and approaches to the quality or configuration of the product (Caves, 2000). Hence, groups' demographic composition and, more specifically, members' diversity now becomes a critical vehicle for driving creative processes in a group (cf., Harrison & Klein, 2007; Mannix & Neale, 2005; Williams & O'Reilly, 1998).

Research also shows the importance of group-level constructs affecting creative outcomes (cf. Nonaka, Umemoto, & Senoo, 1996;

Williams & O'Reilly, 1998). Some studies indicate that informational diversity within the team leads to positive outcomes such as greater information sharing (Zellmer-Bruhn, Maloney, Bhappu, & Salvador, 2008) and a greater number of new ideas and products (Vissers & Dankbaar, 2002). Yet, other studies indicate no positive effects of informational diversity on creativity (Anderson, 2003; Hobman, Bordia, & Gallois, 2004). Although this research on informational diversity has led to many important insights into how diversity affects creative outcomes, cumulative findings have been inconsistent. In response, alternative research has recently emerged to understand how group composition may also function as a *moderator* in shaping the attitudes and behaviors in diverse groups (e.g., Cummings, 2004; Joshi, Liao, & Jackson, 2006). Joshi et al. (2006) examined whether work group composition plays a role in shaping perceived pay inequalities. Prior work by Michel and Hambrick (1992) also alludes to the moderating role of functional diversity in firms. Besides, research by Jehn, Northcraft, and Neale (1999) has shown that certain forms of diversity can moderate the main effects of other forms of diversity. Extending this line of research into the domain of creativity, we theorize about the role of diversity in shaping creative cultures in groups. More specifically, we argue that diversity may represent a theoretically meaningful potential moderator of the desired culture-actual culture of creativity relationship in groups.

Informational Faultlines

In our conceptualization of group diversity, we focus on the issue of demographic alignment as put forth in the group faultline theory introduced by Lau and Murnighan (1998). Prior research on group diversity has largely conceptualized diversity as the degree of differences on relevant attributes between group members (Alexander, Nuchols, Bloom, & Lee, 1995). This work has been often criticized for the assumption that these attributes are independent. For instance, when examining functional differences, tenure has been ignored, leading to the assumption that the experiences of software engineers who have been just hired to work on a project team would be similar to that of engineers who have already spent years there in an otherwise identical group (e.g., De Luca, & Atuahene-Gima, 2007; Gebert, Boerner, & Kearney, 2006; Sethi, Smith, & Park, 2001). The group faultline perspective on diversity, in turn, argues that studying *interacting* multiple attributes "together" rather than separately might provide additional insights into group behavior (e.g., Lau & Murnighan, 1998).

A guiding tenet of the faultline framework is that the intergroup dynamics between emerging subgroups should be stronger than the intergroup dynamics between individuals (Insko, Schopler, Hoyle, Dardis, & Graetz, 1990). Additional perceptual categorizations and behavioral outcomes are expected in faultline-based groups, as subgroups emerge based on overlapping similarities along multiple attributes. The added effect of this overlap results in less fluid and more stable subgroups. These subgroups have the potential to provide mutual social support to their members (Wildschut, Insko, & Gaertner, 2002) and promote social competition (Insko & Schopler, 1987; Schopler, Insko, Graetz, Drigotas, & Smith, 1991).

Even though faultlines can arise from differences across a number of dimensions, we focus on the kind of faultlines that develop along informational attributes (e.g., company tenure, education). Informational faultlines are group splits based on differences in task-relevant categories; they are based on attributes of individuals that are directly related to their professional performance (Bezrukova, Jehn, Zanutto, & Thatcher, in press). Examples of facets of informational faultlines include education (both field and level), amount of work experience relevant to current job, tenure in a company, position in organizational hierarchy, pretask information level, etc. Our choice of informational faultlines was driven by two reasons. First, we concentrate on informational faultlines because we believe that this type of faultline has the most organizational relevance for creative companies. IBM's "The Black Team" epitomizes this idea of disciplinary differences (conceptually, faultlines) as having the potential to facilitate group creativity. Here, a faultline existed between testers (whose sole purpose is to find flaws in indigenously developed code) and the code-developers, both of which are the mainstays of software companies. Such group division brought in a spirit of competition across faultline subgroups, which ultimately helped the team to come up with and share more ideas while dealing with mundane tasks such as testing. Eventually, this evolving culture of the group has lead to a change at the organizational level itself (DeMarco & Lister, 1999).

Second, following Jehn, et al. (1997, 1999) who have stressed the value in differentiating between types of diversity, we believe that unlike other types of diversity, informational faultlines might have the most implications for creative processes in diverse workgroups. For instance, researchers have suggested that the effects of diversity in groups depend on the degree of job-relatedness of the attribute (Webber & Donahue, 2001) and the potential for information use (Dahlin, Weingart, & Hinds, 2005). The range of skills (Reagans & Zuckerman, 2001), variety in member experience levels

(Gruenfeld, Martorana, & Fan, 2000), knowledge factions (Gruenfeld, Thomas-Hunt, & Kim, 1998) – or what Jehn et al. (1999) termed as "informational diversity" – have been shown to influence both volume and uniqueness of creative outcomes. Related research on "diversity of knowledge" (Gruenfeld & Hollingshead, 1993; Lapre &Van Wassenhove, 2001; Phillips, Mannix, Neale, & Gruenfeld, 2004; Taylor & Greve, 2006; Rodan, 2002), "cognitive diversity" (Paulus, 2000b), "diverse perspectives" (Hambrick & Mason,1984; Hambrick, 1998), and "functional or expertness diversity" (Bunderson & Sutcliffe, 2002; Van Der Vegt & Bunderson, 2005; Van Der Vegt, Bunderson & Oosterhof, 2006) all indicate that informational composition of teams have bearings on creative outcomes. For example, concurrent engineering (bringing together members of different knowledge domains) has been shown to have a critical importance in stimulating the cross-fertilization of ideas and creative outcomes of higher quality (Umemoto, Endo, & Machado, 2004).

Finally, whereas the topic of demographic faultlines and their effects on team processes and outcomes has attracted a lot of research attention (e.g., Earley & Mosakowski, 2000; Lau & Murnighan, 2005; Li & Hambrick, 2005; Molleman, 2005; Pearsall et al., 2008), informational faultlines have by far received less attention. Exceptions include a few pioneering studies that have looked at informational faultlines in terms of information availability (Homan, van Knippenberg, van Kleef, & De Dreu, 2007) or at the interaction between informational (job function) and demographic faultlines (Sawyer, Houlette, & Yeagley, 2006). To our knowledge, no studies have addressed the topic of informational faultlines within the domain of creativity. Our focus, thus, is on informational faultlines and understanding their role in groups' creative functioning. Unlike past research that has primarily examined faultlines as the determinants of group processes and outcomes (e.g., Lau & Murnighan, 2005; Molleman, 2005; Polzer, Crisp, Jarvenpaa, & Kim, 2006), we study informational faultlines as a moderating variable influencing culture shifts in groups (see Fig. 1).

Moderating Effects of Informational Faultlines

Diversity research has argued that connections and information flows tend to be localized within faultline subgroups of similar members, yet differences across them can broaden the network of external contacts through which a team gains access to valuable resources (Beckman & Haunschild, 2002;

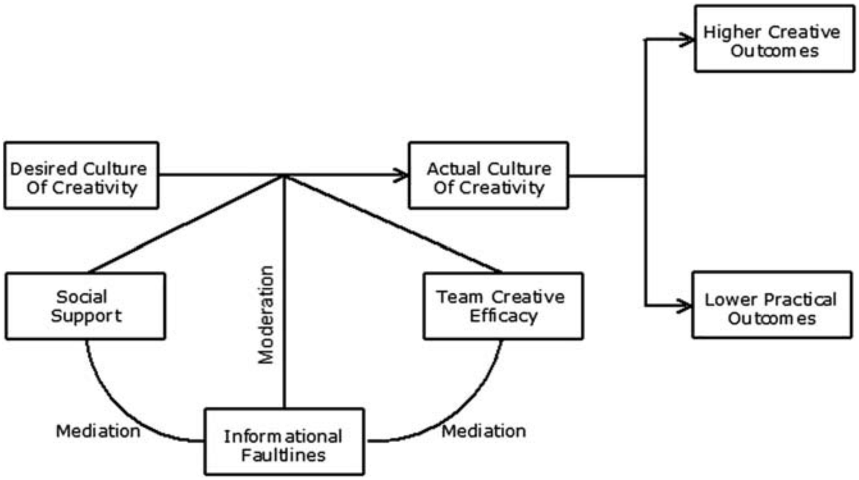

Fig. 1. Theoretical Model.

Mohrman, Tenkasi, & Mohrman, 2003). For instance, past diversity research has shown that members with multiple experiences, backgrounds, or perspectives may increase the information available for problem solving and also enhance the ability of the group to generate creative solutions to problems (Watson, Kumar, & Michaelsen, 1993). Recent empirical research on minority influence has provided additional support for the critical role of informational diversity and opinion minorities in stimulating divergent thinking and creativity (e.g., De Dreu & West, 2001). Similarly, a vast research on newcomers has shown that new configurations of team members based on experience (i.e., newcomers versus old-timers) can be major sources of creativity (e.g., Choi & Thompson, 2005; Perretti & Negro, 2007). In line with this research, recent theorizing on faultlines has suggested that demographic faultlines can be good for creativity (Nishii & Goncalo, 2008). The difference in opinion between faultline subgroups may result in elaborate discussions to describe their respective viewpoints to those on the other side of the informational faultline. These elaborate explanations trigger more discussions (even of tangential information), which increases the opportunity for previously unthought-of creative solutions to be discovered. We follow this line of reasoning and, in contrast to prior work on faultlines (Lau & Murnighan, 1998; Pearsall et al., 2008), argue that faultlines may facilitate creative processes in diverse groups.

Furthermore, faultline subgroups resulting from group splits may not only reduce conformity pressures but also prompt subgroup members to maintain their points of view in the face of opposition (Nemeth, 1985). The resulting diversity of ideas and tolerance of competing viewpoints across faultline subgroups may offer a more conducive atmosphere for group creativity (Goncalo & Staw, 2006). For instance, Kanter (1988) noted that the very nature of creative environments involves controversy and the conditions that promote creativity should allow for coalition formation and multiple structural linkages. Research on minority influence has further shown that the unique perspective of out-group members is expected and may be perceived as valued (Phillips, 2003). As such, members of groups with faultlines may adopt an attitude of mutual positive distinctiveness (Brewer, 1999; Cramton & Hinds 2005) and value their informational differences. This may also elicit environments in which members will be more willing to interact and collaborate across subgroups (Cramton & Hinds 2005; Gibson & Vermeulen, 2003) and convince others of the value in having different viewpoints. This tolerance of informational differences in faultline groups may reduce social inhibition (Nishii & Goncalo, 2008), boost members' confidence in voicing their divergent opinions, and increase members' engagements in activities toward satisfying their desires. As groups with informational faultlines engage more and more in such activities toward their desired goals, their actions may become "routinized" and may turn out to be a part of the group norms (actual culture). Consistent with this idea and based on the discussion above, we expect the following moderating effect:

Proposition 2 (P2). The positive effect of a desired culture on an actual group culture of creativity will be stronger for the groups with strong informational faultlines than it will be for the groups with weak faultlines.

Subgroup Support and Team Creative Efficacy

We now turn our attention to several mechanisms through which this moderating effect of faultlines can operate in diverse groups. As faultline subgroups develop across a divide, they create a separate, independent source of influence, different from a larger group. For instance, differences across faultline subgroups may trigger behavioral disintegration (Li & Hambrick, 2005), whereas informational similarities across members within faultline subgroups may reinforce social support (Phillips, 2003).

Subgroup support is information that leads a person of a faultline subgroup to believe that she is cared for, esteemed, valued, and belongs to a network of communication and mutual obligation (adapted from Cobb, 1976). These subgroups may operate as networks in providing self-help and facilitating within-subgroup communication (Lau & Murnighan, 2005). Furthermore, a wealth of empirical evidence indicates that when individuals face emotional stress (from subgroup opposition, opinion dissent across faultline subgroups, etc.), they seek social support (Halbesleben & Bowler, 2007), and when they receive such support, they feel increased confidence (cf., La Rocco & Jones, 1978; Schaubroeck & Fink, 1998). Specific to creativity, research shows that coworker support may add to a promotive context for creativity (Zhou & George, 2001), boosts members' mood states, and buffer them from entering negative mind states when they voice their opinions in front of others (Madjar, Oldham, & Pratt, 2002). This confidence that subgroup members gain from having their in-group members "on their side" while speaking about divergent ideas, may well become a group norm over time (White, Hogg, & Terry, 2002; Wood, Lundgren, Ouellette, Busceme, & Blackstone, 1994) and evolve into an actual culture of creativity. Subgroup support can also attach social approval to activities that may stimulate the extent to which group members encourage the development of novel ideas and believe that creativity is important for their group (Caldwell & O'Reilly, 2003). Taken together, these considerations suggest that subgroup support will mediate the interactive effect of informational faultlines and a desired culture on an actual group culture of creativity.

Proposition 3 (P3). The moderating effect of informational faultlines on the relationship between a desired and an actual group culture of creativity will be mediated by subgroup social support.

We believe that team creative efficacy will be another important mediating variable that might explain the moderating role of informational faultlines in facilitating culture shifts. Team creative efficacy is usually defined as the extent to which a group believes it can accomplish its creative tasks successfully through concentrated effort (Shin & Zhou, 2007). Related research on self-efficacy suggests that group members often assess their personal and situational resources and constraints and then rely on these assessments to form efficacy judgments (Bandura, 1997; Gist & Mitchell, 1992). We argue that "likely" divergent viewpoints across information-based faultline subgroups can be perceived as a wider resource pool that can cue for team creative efficacy calculations. Research also proposes that higher levels of group-efficacy (more general belief in a team's capacity to perform its tasks across many domains, Gibson, Randel, & Earley, 2000) bode well for collective confidence, responsibility, understanding, ability to share and use knowledge, and to engage in creative actions (Gibson & Vermeulen, 2003; Rico, Sanchez-Manzanares, Gil, & Gibson, 2008). This sense of increased efficacy and beliefs in a group's capability to organize and execute the course of action in groups with informational faultlines can promote more engagement in creativity-conducive activities and an openness to change (Wanberg & Banas, 2000), allowing for creativity culture to evolve. Since efficacy influences group members' motivation to act (Bandura, 1997), members of groups with faultlines may work harder, exerting more effort in shifting their group's culture from a desired state to an actual state. Thus, we predict that:

> **Proposition 4 (P4).** The moderating effect of informational faultlines on the relationship between a desired and an actual group culture of creativity will be mediated by team creative efficacy.

CREATIVE AND PRACTICAL PERFORMANCE

We define practical performance as the attainment of a set of non-creativity related professional goals established by the immediate manager, who is responsible for evaluating the members' contribution to organizational targets. Research has shown that when a group desires incremental improvement, more practical ideas are less divergent (Kirton, 1976) and more useful than more creative ideas that can take the group in a new direction. Past research has also shown how quantity of ideas can be negatively correlated with their quality (Cady & Valentine, 1999, report a negative correlation of $r = -0.34$, $p < 0.01$ between these two constructs). Given that efficient behavior (i.e., quantity and quality) may not necessarily share the characteristics of creative behavior (Staw, 1984), the antecedents of creative performance may differ from those of practical performance. For instance, creative groups must tolerate greater variance in both work attitudes and behaviors (Staw, 1995). Because a creative idea usually requires one to do something in a new and different way (Amabile, 1988), the greater the novelty of an idea the more likely will there be a departure from current organizational beliefs and values. Hence, the group's goals toward deliverables may not necessarily coincide with its search for new ideas and creative solutions (Bain et al., 2001). This is probably why managers may perceive groups with a strong creative drive as inherently threatening and evaluate group performance as low.

In addition, creative teams may have a greater potential for conflict and hence performance losses (Jehn et al. 1997; Pelled, Eisenhardt, & Xin, 1999) due to hindered interactions resulting from members' differences in viewpoints and opinions (Lovelace, Shapiro, & Weingart, 2001; cf., Williams & O'Reilly, 1998). The dissent caused by this drive toward creativity may lead to more conflict within the group and may, thus, provide more impetus toward deviation from the smooth functioning of the team. However, managers are goal-oriented and conduct evaluations frequently on the "bottom-line" basis where the absolute outcome achieved by the employee is measured, while ignoring the other intangible contributions to the group processes. This downward spiral born from the strong affiliation with creativity may have a deleterious effect on performance outcomes and may lead to a negative appraisal by the manager. Hence, we argue that groups with a strong emphasis on creativity may not be as efficient as a group without such focus, but they are more likely to provide fertile ground for creative ideas.

Proposition 5 (P5). An actual culture of creativity will be positively associated with creative performance and negatively associated with practical performance.

DISCUSSION

The purpose of this chapter was to understand the interplay between group faultlines, a group culture of creativity, and group creativity and performance. We developed a theoretical model of culture shifts in diverse groups and examined the relationship between a desired culture of creativity and an actual culture of creativity. We also investigated how the strength of the informational faultline can elicit such culture shifts in teams and what mechanisms can be responsible for the faultline effects. Finally, we proposed how a group's culture of creativity might have the opposite effects on team creativity and group performance.

Contributions to Extant Literature

Our paper extends and integrates three independent streams of scientific literature. First, we contribute to the research on creativity and innovation by theorizing about the role of diversity and, more specifically, informational faultlines as the *structural* determinants of creativity in emerging creative environments. We argue that a culture shift will occur when a group's desire and need for creativity is well recognized, accepted, and manifested in actual creativity culture and that this process will be moderated by informational faultlines. We show how faultlines can add to team creative efficacy and be viewed as pockets of social support and contexts that facilitate culture shifts by directing employees' attention and cognitive energy toward generation of new and useful ideas. We further predict that when the actual group culture of creativity is fully realized, there will be more creativity in teams, but group performance may be adversely affected. In developing our arguments, we draw on past research that has shown how quantity of ideas can be negatively correlated with their quality (e.g., Cady & Valentine, 1999) and that creativity may bear negative results for the team's productivity (Jehn et al., 1997; Pelled et al., 1999). Furthermore, we extend this line of research into the domain of organizational culture by theorizing about how creative cultures can have differential impacts on creative and productive outcomes in groups.

Second, we contribute to the research on faultlines by conceptualizing them as a *moderating* variable that influences the evolution of the team's desired culture into an actual culture of creativity. We also focus on informational faultlines, as we believe that these types of faultlines would have the most implications for emerging creative processes in diverse groups. While prior arguments put forth by Lau and Murnighan (1998) and recently empirically supported by Pearsall et al. (2008) focused on the detrimental nature of faultlines, we argue that faultlines may produce the potential for creativity. Our argument is consistent with past research on diversity and faultlines that has closely looked into the processes behind the effects of group composition on creativity. Homan et al. (2007) along with van Knippenberg, De Dreu, and Homan (2004) have argued that greater informational diversity begets more intense elaboration and discussion of the matter at hand due to the variety of information that team members bring to the table. Nishii and Goncalo (2008) further opine that groups with strong faultlines may offer some form of social support within their subgroups, and that because of this, the subgroup members may voice their ideas freely, without fear. This, coupled with the decreased possibility of groupthink in strong faultline teams due to the greater chance of task conflict (Jehn, 1994), makes the situation ripe for maximum creativity to emerge. Next, we extend this literature by theorizing about how faultlines may act as a *positive* force and a catalyst that stimulates a cultural shift in diverse groups.

A third contribution this paper makes is to the literature on organizational culture. We add to research in this domain by applying a dynamic perspective on the meso-culture (group level) rather than focusing on the stagnant nature of macro-culture (organizational level). Though an organizational culture of creativity and the various factors (information, diversity, etc.) that influence an employee's assimilation into it are well documented (Baer & Frese, 2003; Flynn & Chatman, 2001; Klein & Sorra, 1996), it has not been studied extensively at the group level (see for exceptions Bain et al., 2001; Caldwell & O'Reilly, 2003). Most research on organizational culture has also viewed culture as a relatively stable structured set of symbolic meanings that are shared by a group of people (Audia & Goncalo, 2007; Caldwell & O'Reilly, 2003; Flynn & Chatman, 2001; O'Reilly & Chatman, 1996). We take a "temporal" perspective and examine how culture can evolve over time. More specifically, we examine the process by which a desired culture of creativity changes into an actual culture of creativity in diverse groups and focus on how this process will be facilitated by group faultlines. We also address the performance implications of creative group cultures by developing the links across various dimensions of group performance, and by considering creative as well as practical performance of diverse groups. Our focus on creative outcomes in addition to group performance allows us to understand the diversity and cultural implications for creative group processes better.

Future Research Agenda

Organizational teams do not function in insulated situations where only informational faultlines may split the team. When other demographic attributes (age, gender, etc.) are salient, they may also influence faultline subgroup formation. There is a need in diversity research today to fully understand *how* different types of faultlines (demographic and informational) interact with each other in real-world settings. For instance, it would be interesting to see how age faultlines (see Helson, Roberts, & Agronick, 1995; Nerkar, 2003; Ng & Feldman, 2008 for discussions on age and creativity) interact with informational faultlines. The creative pioneers from the technology sector are now facing savvy newcomers from an entirely new generation, with whom they may match along some informational attributes, but not along the dimension of age. Research on this topic would be very relevant for creative sectors of the economy. A related issue that needs to be addressed in future research would be to examine which *type* of faultline exerts the maximum power in shifting the desired culture toward an actual culture of creativity. In other words, we would like to know whether informational faultlines continue their positive influence in the presence of demographic faultlines. Another way to extend this line of research is to look at the effects of membership changes on culture shifts. For instance, Choi and Thompson (2005) found that membership changes enhance group creativity as new members in the team make the group revisit its information and processes as part of the induction process of the newcomer. Such reassessments may well energize the group toward the goals that it started out with, or may even derail its progress.

One more potential avenue of research is to look at the differences in effects for weak, moderate, and strong faultlines. While we have argued that strong informational faultlines might lead to strong subgroup support and team creative efficacy, one might also wonder whether such strong faultlines might result in such high levels of conflict that they may become dysfunctional. In this case, perhaps moderate faultlines can be more beneficial in facilitating culture shifts. For instance, performing creative activities in faultline groups can be expected to give rise to greater conflict, as it is well known that people react strongly to the opposing party and are reluctant to compromise when identity-relevant issues are at stake (e.g., Druckman & Zechmeister, 1970). Although we do not focus on identifying the potential sources of negative influence of faultlines on the link between a desired and actual culture, including conflict, in this chapter, we think this is a very interesting question to address in future research. Another area to explore would be to understand the reasons for the reduction in practical performance when a culture of creativity manifests itself in informationally diverse groups. There may be possibilities to explore evaluation errors by managers, who may pay lip service to creativity, but may implicitly desire only for practical outputs from their team members.

On another dimension, there might be a potential for clarifying the debate around creative cultures and innovation. For instance, some researchers argue that a culture of creativity can be linked to innovation as the latter cannot survive without promoting the former (Andriopoulous, 2001; Flynn, Dooley, O'Sullivan, & Cormican, 2003; Paulus, 2000b). Yet, others suggest that a highly creative environment may not be good for organizational innovation since innovation often requires more formalization, which creative cultures may not necessarily support (Janssen, van de Vliert, & West, 2004). However, there is consensus on both sides in mentioning the benefits of a workgroup environment filled with support, tolerance, and encouragement of creative behaviors (McFadzean, 1998), but there is still much to learn about how creative cultures may influence innovation in workgroups. Furthermore, while we have discussed a culture specific to creativity in this paper, other facets of organizational culture (cf., risk taking, experimentation, tolerance, competition, etc., O'Reilly et al., 1991) can have repercussions on the team's creative behavior as well. By way of illustration, it would be interesting to see if a culture of competition among subgroup members bodes well for creative outcomes, or if a culture of cooperation would attenuate creative behavior by stifling dissent and putting team discussion into tedium. Future research should pursue analyzing such related aspects of organizational subcultures to understand the role of contextual factors in stimulating creative behavior in faultline groups. Following O'Reilly et al.'s (1991) footsteps, we also need to study how these subcultures interact, whether group members' alignment to different cultures matters, and why effects of these alignments may differ for members within the same organization.

It is also important to know when the cultural shifts may fail to emerge. For instance, if the group's desire for creativity is in conflict with some higher-level organizational goals directed toward more conservative approaches, shifts toward a creative culture may not be encouraged, and may not occur. In fact, such nonalignment of culture supportive of creativity and organizational goals that do not support such creativity may override the positive effects of informational faultlines in facilitating culture shifts. Research should also look at another potential mediator, conflict, and how it may impact the functioning of the team. For instance, depending on the type of conflict (task or relationship), conflict mediation can work in the opposite directions: task conflict may enhance the moderating effect of faultlines in facilitating culture shifts by stimulating more action and engagement in discussion, whereas relationship conflict may weaken such effect by taking group members' energy away from focusing on solidifying the culture of creativity.

Practical Implications

It has clearly been established how vital creativity is for organizational success (Florida, 2002, 2004). Our theoretical model suggests that work groups for whom *creativity* is a critical-to-quality characteristic (e.g., research teams) would benefit enormously from assimilating members from informationally diverse backgrounds. Groups with informational faultlines may have the most return on investment in the form of creative outputs, whereas workgroups without such divisions may not achieve the desired outcome. This is only true for the teams where creativity and innovation are required attributes and the main criteria of group performance. In the context where creativity is critical, organizations might focus their efforts on maintaining social support in groups with faultlines and on increasing their team creative efficacy. For instance, organizations may focus on team-building programs (group exercises, branding teams) to promote a sense of camaraderie within groups with faultlines. The expected increase in social support will in turn bolster confidence to explore creative viewpoints and to foster a culture of creativity. To optimize team creative efficacy, firms may use interventions such as self-guided training or guided exploration, which may enhance members' feeling that they can be creative (Debowski, Wood, & Bandura, 2001; Latham & Budworth, 2006). Finally, managers should be aware of the potential negative effect of a strong culture of creativity on group performance outcomes. Thus, they should strive to maintain a balance between how creative they want the teams to be and their productivity expectations.

In this chapter, by exploring the complex interplay between culture shifts and group splits, we have analyzed how groups' informational faultlines may stimulate a change in groups' culture which then in turn can influence group creativity and performance. As we take the first steps toward developing a new map of the diversity–creativity terrain, we hope to help businesses navigate better toward their goals.

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REFERENCES

Adarvers-yorno, I., Postmes, T., & Haslam, S. A. (2006). Social identity and the recognition of creativity in groups. *British Journal of Social Psychology*, *45*, 479–497.

Adkins, B., & Caldwell, D. (2004). Firm or subgroup culture: Where does fitting in matter most? *Journal of Organizational Behavior*, *25*, 969–978.

Alexander, J., Nuchols, B., Bloom, J., & Lee, S. (1995). Organizational demography and turnover: An examination of multiform and nonlinear heterogeneity. *Human Relations*, *48*(12), 1455–1480.

Alvesson, M. (1993). Organization as rhetoric: Knowledge-intensive companies and the struggle with ambiguity. *Journal of Management Studies*, *30*(6), 997–1015.

Amabile, T. M. (1988). A model of creativity and innovation in organizations. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 10, pp. 123–167). Greenwich, CT: JAI Press.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*(5), 1154–1184.

Ancona, D. G., & Caldwell, D. F. (1992). Bridging the boundary: External activity and performance in organizational teams. *Administrative Science Quarterly*, *37*(4), 634–665.

Anderson, T. (2003). *Diversity: Stacking up the evidence*. New York, NY: CIPD Publishing.

Andriopoulous, C. (2001). Determinants of organizational creativity: A literature review. *Management Decision*, *39*(10), 834–840.

Audia, P. G., & Goncalo, J. A. (2007). Past success and creativity over time: A study of inventors in the hard disk drive industry. *Management Science*, *53*(1), 1–15.

Austin, J. R. (1997). A cognitive framework for understanding demographic influences in groups. *International Journal of Organizational Analysis*, *5*(4), 342–359.

Baer, M., & Frese, M. (2003). Innovation is not enough: Climates for innovative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behavior*, *24*, 45–68.

Bain, P. G., Mann, L., & Pirola-Merlo, A. (2001). The innovation imperative: The relationships between team climate, innovation, and performance in research and development teams. *Small Group Research*, *32*(1), 55–73.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Barney, J. B. (1986). Organizational culture: Can it be a source of sustained competitive advantage? *Academy of Management Review*, *11*(3), 656–665.

Beckman, C. M., & Haunschild, P. R. (2002). Network learning: The effects of heterogeneity of partners' experience on corporate acquisitions. *Administrative Science Quarterly*, *47*(1), 92–124.

Bettenhausen, K. L., & Murnighan, J. K. (1991). The development of an intragroup norm and the effects of interpersonal and structural challenges. *Administrative Science Quarterly*, *36*(1), 20–35.

Bezrukova, K., Jehn, K. A., Zanutto, E., & Thatcher, S. M. B. (2009). Do workgroup faultlines help or hurt? A moderated model of faultlines, team identification, and group performance. *Organization Science*, *20*(1), 35–50.

Boerner, S., & Gebert, D. (2005). Organizational culture and creative processes: Comparing German theatre companies and scientific institutes. *Nonprofit Management and Leadership*, *16*(2), 209–220.

Brewer, M. B. (1999). The psychology of prejudice: Ingroup love or outgroup hate? *Journal of Social Issues*, *55*, 429–444.

Bunderson, J. S., & Sutcliffe, K. M. (2002). Why some teams emphasize learning more than others: Evidence from business unit management teams. In: M. A. Neal, E. A. Mannix &

H. Sondak (Eds), *Research on Managing Groups and Teams* (Vol. 4, pp. 49–84). New York: Elsevier Science.

Burnside, R. M. (1990). Improving corporate climates for creativity. In: M. A. West & J. L. Farr (Eds), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 265–284). Oxford, UK: Wiley.

Burrell, W. G., & Morgan, G. (1979). *Sociological paradigms and organizational analysis.* London, UK: Heinemann.

Cady, S. H., & Valentine, J. (1999). Team innovation and perceptions of consideration: What difference does diversity make? *Small Group Research*, *30*(6), 730–750.

Caldwell, D. F., & O'Reilly, C. A. (2003). The determinants of team-based innovation in organizations: The role of social influence. *Small Group Research*, *34*(4), 497–517.

Camacho, L. M., & Paulus, P. B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology*, *68*(6), 1071–1080.

Causon, J. (2004). The internal brand: Successful cultural change and employee empowerment. *Journal of Change Management*, *4*(4), 297–307.

Caves, R. E. (2000). *Creative Industries: Contracts between art and commerce*. Cambridge, MA: Harvard University Press.

Cecil, E. A., Cummings, L. L., & Chertkoff, J. M. (1973). Group composition and choice shift: Implications for administration. *Academy of Management Journal*, *16*(3), 412–422.

Chatman, J. A., & Jehn, K. A. (1994). Assessing the relationship between industry characteristics and organizational culture: How different can you be? *Academy of Management Journal*, *37*(3), 522–553.

Chatman, J. A., Polzer, J. T., Barsade, S. G., & Neale, M. A. (1998). Being different yet feeling similar: The influence of demographic composition and organizational culture on work processes and outcomes. *Administrative Science Quarterly*, *43*(4), 749–780.

Chatman, J. A., & Spataro, S. E. (2005). Using self-categorization theory to understand relational demography-based variations in people's responsiveness to organizational culture. *Academy of Management Journal*, *48*(2), 321–331.

Choi, H., & Thompson, L. (2005). Old wine in a new bottle: Impact of membership change on group creativity. *Organizational Behavior and Human Decision Processes*, *98*(2), 121–132.

Choi, J. N. (2004). Person-environment fit and creative behavior: Differential impacts of supplies-values and demands-abilities versions of fit. *Human Relations*, *57*(5), 531–552.

Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, *38*(5), 300–314.

Corley, K. G., & Gioia, D. A. (2004). Identity ambiguity and change in the wake of a corporate spin-off. *Administrative Science Quarterly*, *49*(2), 173–208.

Cramton, C. D., & Hinds, P. J. (2005). Subgroup dynamics in internationally distributed teams: Ethnocentrism or cross-national learning? In: B. Staw & R. Kramer (Eds), *Research in Organizational Behavior* (pp. 231–263). Oxford, UK: Elsevier Science Inc.

Cummings, J. N. (2004). Work groups, structural diversity, and knowledge sharing in a global organization. *Management Science*, *50*(3), 352–364.

Dahlin, K. B., Weingart, L. R., & Hinds, P. J. (2005). Team diversity and information use. *Academy of Management Journal*, *48*(6), 1107–1123.

Debowski, S., Wood, R. E., & Bandura, A. (2001). The impact of guided exploration and enactive exploration on self-regulatory mechanisms and information acquisition through electronic enquiry. *Journal of Applied Psychology*, *86*(6), 1129–1141.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*(6), 1191–1201.

DeFillippi, R., Grabher, G., & Jones, C. (2007). Introduction to paradoxes of creativity: Managerial and organizational challenges in the cultural economy. *Journal of Organizational Behavior*, *28*(5), 511–521.

De Luca, L. M., & Atuahene-Gima, K. (2007). Market knowledge dimensions and cross-functional collaboration: Examining the different routes to product innovation performance. *Journal of Marketing*, *71*(1), 95–112.

DeMarco, T., & Lister, T. (1999). *Peopleware: Productive projects and teams*. New York, NY: Dorset House Publications.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*(3), 497–509.

Dombrowski, C., Kim, J. Y., Desouza, K. C., Braganza, A., Papagari, S., Baloh, P., & Jha, S. (2007). Elements of innovative cultures. *Knowledge & Process Management*, *14*(3), 190–202.

Drazin, R., Glynn, M. A., & Kazanjian, R. K. (1999). Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review*, *24*, 286–307.

Druckman, D., & Zechmeister, K. (1970). Conflict of interest and value dissent. *Human Relations*, *23*, 431–438.

Earley, P. C., & Mosakowski, E. (2000). Creating hybrid team cultures: An empirical test of transnational team functioning. *Academy of Management Journal*, *43*, 26–49.

Enz, C. A. (1988). The role of value congruity in intraorganizational power. *Administrative Science Quarterly*, *33*(2), 284–304.

Fiol, C. M. (2002). Capitalizing on paradox: The role of language in transforming organizational identities. *Organization Science*, *13*(6), 653–666.

Florida, R. L. (2002). *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. New York, NY: Basic Books.

Florida, R. L. (2004). *The flight of the creative class: Why America is losing the competition for talent- and what we can do to win prosperity back*. New York, NY: HarperCollins.

Flynn, F. J., & Chatman, J. A. (2001). Strong cultures and innovation: Oxymoron or opportunity? In: C. Cooper, C. Earley, J. Chatman & W. Starbuck (Eds), *Handbook of organizational culture* (pp. 263–288). West Sussex, UK: Wiley.

Flynn, M., Dooley, L., O'Sullivan, D., & Cormican, K. (2003). Idea management for organisational innovation. *International Journal of Innovation Management*, *7*, 417–442.

Gebert, D., & Boerner, S. (1999). The open and the closed corporation as conflicting forms of organization. *Journal of Applied Behavioral Science*, *35*(3), 341–359.

Gebert, D., Boerner, S., & Kearney, E. (2006). Cross-functionality and innovation in new product development teams: A dilemmatic structure and its consequences for the management of diversity. *European Journal of Work and Organizational Psychology*, *15*(4), 431–458.

Gibson, C., & Vermeulen, F. (2003). A healthy divide: Subgroups as a stimulus for team learning behavior. *Administrative Science Quarterly*, *48*(2), 202–239.

Gibson, C. B., Randel, A., & Earley, P. C. (2000). Understanding group efficacy: An empirical test of multiple assessment methods. *Group & Organization Management*, *25*, 67–97.

Gioia, D. A., Schultz, M., & Corley, K. G. (2000). Organizational identity, image and adaptive instability. *Academy of Management Review*, *25*(1), 63–81.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, *17*, 183–211.

Goncalo, J. A., & Staw, B. M. (2006). Individualism-collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*(1), 96–109.

Gregory, K. L. (1983). Native-view paradigms: Multiple cultures and culture conflicts in organizations. *Administrative Science Quarterly*, *28*(3), 359–376.

Grossman, L. (2005). How apple does it. *Time*, *166*(17), 66–70.

Gruenfeld, D. H., & Hollingshead, A. B. (1993). Sociocognition in work groups: The evolution of group integrative complexity and its relation to task performance. *Small Group Research*, *24*(3), 383–405.

Gruenfeld, D. H., Martorana, P. V., & Fan, E. T. (2000). What do groups learn from their worldliest members? Direct and indirect influence in dynamic teams. *Organizational Behavior and Human Decision Processes*, *82*(1), 45–59.

Gruenfeld, D. H., Thomas-Hunt, M. C., & Kim, P. H. (1998). Cognitive flexibility, communication strategy, and integrative complexity in groups: Public versus private reactions to majority and minority status. *Journal of Experimental Social Psychology*, *34*(2), 202–226.

Halbesleben, J. R. B., & Bowler, W. M. (2007). Emotional exhaustion and job performance: The mediating role of motivation. *Journal of Applied Psychology*, *92*(1), 93–106.

Hambrick, D. C. (1998). Corporate coherence and the top management team. *Strategy & Leadership*, *25*(5), 24–29.

Hambrick, D. C., & Mason, P. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, *9*, 193–206.

Haner, U. (2005). Spaces for creativity and innovation in two established organizations. *Creativity and Innovation Management*, *14*(3), 289–298.

Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review*, *32*(4), 1199–1228.

Helson, R., Roberts, B., & Agronick, G. (1995). Enduringness and change in creative personality and the prediction of occupational creativity. *Journal of Personality and Social Psychology*, *69*(6), 1173–1183.

Hesselbein, F. (2008). The key to cultural transformation. In: F. Hesselbein & A. Shrader (Eds), *Leader to leader 2: Enduring insights on leadership from the Leader to Leader Institute's award-winning journal* (pp. 267–270). San Francisco, CA: Jossey-Bass.

Hobman, E. V., Bordia, P., & Gallois, C. (2004). Perceived dissimilarity and work group involvement: The moderating effects of group openness to diversity. *Group & Organization Management*, *29*(5), 560–587.

Homan, A. C., van Knippenberg, D., Van Kleef, G. A., & De Dreu, C. K. W. (2007). Bridging faultlines by valuing diversity: Diversity beliefs, information elaboration, and performance in diverse work groups. *Journal of Applied Psychology*, *92*(5), 1190–1199.

Hunter, S. T., Bedell, K. E., & Mumford, M. D. (2007). Climate for creativity: A quantitative review. *Creativity Research Journal*, *19*(1), 69–90.

Insko, C. A., & Schopler, J. (1987). Categorization, competition, and collectivity. In: H. Clyde (Ed.), *Group processes* (pp. 213–251). Thousand Oaks, CA: Sage Publications, Inc.

Insko, C. A., Schopler, J., Hoyle, R. H., Dardis, G. J., & Graetz, K. A. (1990). Individual-group discontinuity as a function of fear and greed. *Journal of Personality and Social Psychology*, *58*(1), 68–79.

Janssen, O., van de Vliert, E., & West, M. (2004). The bright and dark sides of individual and group innovation: A special issue introduction. *Journal of Organizational Behavior*, *25*(2), 129–145.

Jehn, K. A. (1994). Enhancing effectiveness: An investigation of advantages and disadvantages of value-based intragroup conflict. *International Journal of Conflict Management*, *5*(3), 223–238.

Jehn, K. A., Chadwick, C., & Thatcher, S. M. B. (1997). To agree or not to agree: The effects of value congruence, individual demographic dissimilarity, and conflict on workgroup outcomes. *International Journal of Conflict Management*, *8*, 287–305.

Jehn, K. A., Northcraft, G. B., & Neale, M. A. (1999). Why Differences Make a Difference: A Field Study of Diversity, Conflict and Performance in Workgroups. *Administrative Science Quarterly*, *44*(4), 741–763.

Joshi, A., Liao, H., & Jackson, S. E. (2006). Cross-level effects of workplace diversity on sales performance and pay. *Academy of Management Journal*, *49*(3), 459–481.

Kanter, R. M. (1988). Three tiers for innovation research. *Communication Research*, *15*(5), 509–523.

Kashima, Y. (2002). Culture and self: A cultural dynamical analysis. In: Y. Kashima, M. Foddy & M. J. Platow (Eds), *Self and identity: Personal, social, and symbolic* (pp. 207–226). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Kirton, M. (1976). Adaptors and innovators: A description and measure. *Journal of Applied Psychology*, *61*(5), 622–629.

Klein, K. J., & Sorra, J. (1996). The challenge of innovation implementation. *Academy of Management Review*, *21*(4), 1055–1080.

Lapre, M. A., & Van Wassenhove, L. N. (2001). Creating and transferring knowledge for productivity improvement in factories. *Management Science*, *47*(10), 1311–1325.

La Rocco, J. M., & Jones, A. P. (1978). Co-worker and leader support as moderators of stress–strain relationships in work situations. *Journal of Applied Psychology*, *63*(5), 629–634.

Latham, G. P., & Budworth, M. (2006). The effect of training in verbal self-guidance on the self-efficacy and performance of Native North Americans in the selection interview. *Journal of Vocational Behavior*, *68*(3), 516–523.

Lau, D., & Murnighan, J. K. (1998). Demographic diversity and faultlines: The compositional dynamics of organizational groups. *Academy of Management Review*, *23*, 325–340.

Lau, D., & Murnighan, J. K. (2005). Interactions within groups and subgroups: The Effects of demographic faultlines. *Academy of Management Journal*, *48*(4), 645–659.

Li, J. T., & Hambrick, D. C. (2005). Factional groups: A new vantage on demographic faultlines, conflict, and disintegration in work teams. *Academy of Management Journal*, *48*, 794–813.

Litchfield, R. C. (2008). Brainstorming reconsidered: A goal-based view. *Academy of Management Review*, *33*(3), 649–668.

Locke, E. A., Tirnauer, D., Roberson, Q., Goldman, B., Latham, M. E., & Weldon, E. (2001). The importance of the individual in an age of groupism. In: M. Turner (Ed.), *Groups at Work: Theory and Research* (pp. 501–528). Mahway, NJ: Lawrence Erlbaum Associates Publishers.

Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communications perspective. *Academy of Management Journal*, *44*(4), 779–793.

MacNeil, M. K., & Sherif, M. (1976). Norm change over subject generations as a function of arbitrariness of prescribed norms. *Journal of Personality and Social Psychology*, *34*(5), 762–773.

Madjar, N., Oldham, G. R., & Pratt, M. G. (2002). There's no place like home? The contributions of work and nonwork creativity support to employees' creative performance. *Academy of Management Journal*, *45*(4), 757–767.

Mannix, E. A., & Neale, M. A. (2005). What differences make a difference? *Psychological Science in the Public Interest*, *6*, 31–55.

Mannix, E. A., Thatcher, S. M. B., & Jehn, K. A. (2001). Does culture always flow downstream? Linking group consensus and organizational culture. In: S. Cartwright, C. Cooper, C. Earley, J. Chatman, N. Holden, T. Cummings, P. Sparrow & W. Starbuck (Eds), *International Handbook of Organizational Culture and Climate* (pp. 620–631). Chicester, NY: Wiley.

Martin, J. (1992). *Cultures in organizations: Three perspectives*. New York, NY: Oxford University Press.

Martin, J. (2002). *Organizational culture: Mapping the terrain*. Thousand Oaks, CA: Sage.

McFadzean, E. S. (1998). Enhancing creative thinking within organizations. *Management Decision*, *36*(5), 309–315.

McLeod, P. L., Lobel, S. A., & Cox, T. H. (1996). Ethnic diversity and creativity in small groups. *Small Group Research*, *27*(2), 248–264.

Meglino, B. M., Ravlin, E. C., & Adkins, C. L. (1989). A work values approach to corporate culture: A field test of the value congruence process and its relationship to individual outcomes. *Journal of Applied Psychology*, *74*(3), 424–432.

Michel, J. G., & Hambrick, D. (1992). Diversification posture and top management team characteristics. *Academy of Management Journal*, *35*, 9–37.

Mohrman, S. A., Tenkasi, R. V., & Mohrman, A. M. (2003). The role of networks in fundamental organizational change: A grounded analysis. *Journal of Applied Behavioral Science*, *39*(3), 301–323.

Molleman, E. (2005). Diversity in demographic characteristics, abilities and personality traits: Do faultlines affect team functioning? *Group Decision and Negotiation*, *14*, 173–193.

Nemeth, C. J. (1985). Dissent, group process, and creativity. In: E. Lawler (Ed.), *Advances in Group Processes theory and research* (pp. 57–75). Greenwich, CT: JAI Press.

Nemeth, C. J., & Ormiston, M. (2007). Creative idea generation: Harmony versus stimulation. *European Journal of Social Psychology*, *37*(3), 524–535.

Nerkar, A. (2003). Old is gold? The value of temporal exploration in the creation of new knowledge. *Management Science*, *49*(2), 211–229.

Ng, T. W. H., & Feldman, D. C. (2008). The relationship of age to ten dimensions of job performance. *Journal of Applied Psychology*, *93*(2), 392–423.

Nishii, L. H., & Goncalo, J. A. (2008). Demographic faultlines and creativity in diverse groups. In: K. W. Phillips, E. A. Mannix & M. A. Neale (Eds), *Research on Managing Groups and Teams* (Vol. 11, pp. 1–26). Greenwich, CT: JAI Press.

Nonaka, I., Umemoto, K., & Senoo, D. (1996). From information processing to knowledge creation: A paradigm shift in business management. *Technology in Society*, *18*(2), 203–218.

Nystrom, H. (1990). Organizational innovation. In: M. A. West & J. L. Farr (Eds), *Innovation and creativity at work* (pp. 143–181). Chichester, UK: Wiley.

Ogbonna, E., & Wilkinson, B. (2003). The false promise of organizational culture change: A case study of middle managers in grocery retailing. *Journal of Management Studies*, *40*(5), 1151–1178.

Ogle, R. (2007). *Smart world: Breakthrough creativity and the new science of ideas*. Cambridge, MA: Harvard Business School Press.

O'Hara, L. A., & Sternberg, R. J. (2000). It doesn't hurt to ask: Effects of instructions to be creative, practical, or analytical on essay – Writing performance and their interaction with students' thinking styles. *Creativity Research Journal*, *13*, 197–210.

O'Reilly, C. A., & Chatman, J. (1996). Culture as social control: Corporations, culture, and commitment. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 18, pp. 157–200). Greenwich, CT: JAI Press.

O'Reilly, C. A., Chatman, J., & Caldwell, D. F. (1991). People and organizational culture: A profile comparison approach to assessing person-organization fit. *Academy of Management Journal*, *34*(3), 487–516.

Paulus, P. B. (2000a). Brainstorming. In: A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 1, pp. 462–463). Washington, DC: American Psychological Association.

Paulus, P. B. (2000b). Groups, teams, and creativity: The creative potential of idea-generating groups. *Applied Psychology: An International Review*, *49*(2), 237–262.

Pearsall, M. J., Ellis, A. P. J., & Evans, J. M. (2008). Unlocking the effects of gender faultlines on team creativity: Is activation the key? *Journal of Applied Psychology*, *93*(1), 225–234.

Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: An analysis of work group diversity, conflict, and performance. *Administrative Science Quarterly*, *44*(1), 1–28.

Perretti, F., & Negro, G. (2007). Mixing genres and matching people: A study in innovation and team composition in Hollywood. *Journal of Organizational Behavior*, *28*(5), 563–586.

Peterson, W. R. (2007). The role of consumer preference development in incremental innovation: How diamond multimedia helped create the iPod. *Texas Law Review*, *85*(6), 1553–1577.

Phillips, K. W. (2003). The effects of categorically based expectations on minority influence: The importance of congruence. *Society for Personality and Social Psychology*, *29*(1), 3–13.

Phillips, K. W., Mannix, E. A., Neale, M. A., & Gruenfeld, D. H. (2004). Diverse groups and information sharing: The effects of congruent ties. *Journal of Experimental Social Psychology*, *40*(4), 497–510.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: Aggregating across people and time. *Journal of Organizational Behavior*, *25*(2), 235–257.

Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., & Kim, J. W. (2006). Extending the faultline model to geographically dispersed teams: How colocated subgroups can impair group functioning. *Academy of Management Journal*, *49*(4), 679–692.

Prahlad, C. K., & Krishnan, M. S. (2008). *The new age of innovation: Driving co-created value through global networks*. Columbus, OH: McGraw-Hill.

Reagans, R., & Zuckerman, E. W. (2001). Networks, diversity, and productivity: The social capital of corporate R&D teams. *Organization Science*, *12*(4), 502–517.

Rico, R., Sanchez-Manzanares, M., Gil, F., & Gibson, C. (2008). Team implicit coordination processes: A team knowledge-based approach. *Academy of Management Review*, *33*(1), 183–184.

Rodan, S. (2002). Innovation and heterogeneous knowledge in managerial contact networks. *Journal of Knowledge Management*, *6*(2), 152–163.

Rodrigues, C. A. (2005). Culture as a determinant of the importance level business students place on ten teaching/learning techniques: A survey of university students. *Journal of Management Development*, *24*(7), 608–621.

Rokeach, M. J. (1973). *The nature of human values*. New York, NY: The Free Press.

Rousseau, D. M. (1990). Normative beliefs in fund-raising organizations: Linking culture to organizational performance and individual responses. *Group & Organization Studies*, *15*(4), 448–460.

Sackmann, S. A. (1992). Culture and subcultures: An analysis of organizational knowledge. *Administrative Science Quarterly*, *37*(1), 140–161.

Sackmann, S. A., & Phillips, M. E. (2004). Contextual influences on culture research: Shifting assumptions for new workplace realities. *International Journal of Cross Cultural Management*, *4*(3), 370–390.

Sawyer, J. E., Houlette, M. A., & Yeagley, E. L. (2006). Decision performance and diversity structure: Comparing faultlines in convergent, crosscut, and racially homogeneous groups. *Organizational Behavior and Human Decision Processes*, *99*, 1–15.

Schaubroeck, J., & Fink, L. S. (1998). Facilitating and inhibiting effects of job control and social support on stress outcomes and role behavior: A contingency model. *Journal of Organizational Behavior*, *19*(2), 167–195.

Schein, E. H. (1992). *Organizational culture and leadership* (2nd ed.). San Francisco, CA: Jossey-Bass.

Schepers, P., & van den Berg, P. T. (2007). Social factors of work environment creativity. *Journal of Business and Psychology*, *21*(3), 407–427.

Schlender, B. (2005). How big can apple get? *Fortune*, *151*(4), 66–76.

Schopler, J., Insko, C. A., Graetz, K. A., Drigotas, S. M., & Smith, V. A. (1991). The generality of the individual-group discontinuity effect: Variations in positivity-negativity of outcomes, players' relative power, and magnitude of outcomes. *Personality and Social Psychology Bulletin*, *17*(6), 612–624.

Sethi, R., Smith, D. C., & Park, C. W. (2001). Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research*, *38*(1), 73–85.

Shalley, C. E., Gilson, L. L., & Blum, T. C. (2000). Matching creativity requirements and the work environment: Effects on satisfaction and intentions to leave. *Academy of Management Journal*, *43*(2), 215–223.

Sherif, M., & Sherif, C. W. (1969). *Social psychology*. New York, NY: Harper & Row.

Shin, S. J., & Zhou, J. (2007). When is educational specialization heterogeneity related to creativity in research and development teams? Transformational leadership as a moderator. *Journal of Applied Psychology*, *92*(6), 1709–1721.

Sørensen, J. B. (2002). The strength of corporate culture and reliability of firm performance. *Administrative Science Quarterly*, *47*, 70–91.

Staw, B. M. (1984). Organizational behavior: A review and reformulation of the field's outcome variables. *Annual Review of Psychology*, *35*, 627–666.

Staw, B. M. (1995). Why no one really wants creativity. In: C. M. Ford & D. A. Gioia (Eds), *Creative action in organizations: Ivory Tower visions and real world voices* (pp. 161–172). Thousand Oaks, CA: Sage.

Stenmark, D. (2005). Organizational creativity in context: Learning from a failing attempt to introduce IT support for creativity. *International Journal of Technology and Human Interaction*, *1*(4), 80–98.

Sterelny, K. (2006). The evolution and evolvability of culture. *Mind & Language*, *21*(2), 137–165.

Taggar, S. (2001). Group composition, creative synergy, and group performance. *Journal of Creative Behavior*, *35*(4), 261–286.

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In: S. Worchel & W. G. Austin (Eds), *Psychology of intergroup relations* (2nd ed., pp. 7–24). Chicago, IL: Nelson-Hall.

Taylor, A., & Greve, H. R. (2006). Superman or the fantastic four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, *49*(4), 723–740.

Thornburg, T. H. (1991). Group size and member diversity influence on creative performance. *Journal of Creative Behavior*, *25*(4), 324–333.

Triandis, H. C., & Suh, E. M. (2002). Cultural influences on personality. *Annual Review of Psychology*, *53*(1), 133–160.

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory*. Oxford, UK: Blackwell.

Umemoto, K., Endo, A., & Machado, M. (2004). From sashimi to zen-in: The evolution of concurrent engineering at Fuji Xerox. *Journal of Knowledge Management*, *8*(4), 89–99.

Van Der Vegt, G. S., & Bunderson, J. S. (2005). Learning and performance in multidisciplinary teams: The importance of collective team identification. *Academy of Management Journal*, *48*(3), 532–547.

Van Der Vegt, G. S., Bunderson, J. S., & Oosterhof, A. (2006). Expertness diversity and interpersonal helping in teams: Why those who need the most help end up getting the least. *Academy of Management Journal*, *49*(5), 877–893.

Van Der Vegt, G. S., Van De Vliert, E., & Huang, X. (2005). Location-level links between diversity and innovative climate depend on national power distance. *Academy of Management Journal*, *48*(6), 1171–1182.

van Knippenberg, D., De Dreu, C. K. W., & Homan, A. C. (2004). Work group diversity and group performance: An integrative model and research agenda. *Journal of Applied Psychology*, *89*(6), 1008–1022.

Vissers, G., & Dankbaar, B. (2002). Creativity in multidisciplinary new product development teams. *Creativity and Innovation Management*, *11*(1), 31–42.

Waldman, D. A., Lituchy, T., Gopalakrishnan, M., Laframboise, K., Galperin, B., & Kaltsounakis, Z. (1998). A qualitative analysis of leadership and quality improvement. *Leadership Quarterly*, *9*(2), 177–201.

Wallach, M. A., Kogan, N., & Bem, D. J. (1962). Group influence on individual risk taking. *The Journal of Abnormal and Social Psychology*, *65*(2), 75–86.

Wanberg, C. R., & Banas, J. T. (2000). Predictors and outcomes of openness to changes in a reorganizing workplace. *Journal of Applied Psychology*, *85*(1), 132–142.

Watson, W. E., Kumar, K., & Michaelsen, L. K. (1993). Cultural diversity's impact on interaction process and performance: Comparing homogeneous and diverse task groups. *Academy of Management Journal*, *36*(3), 590–602.

Webber, S., & Donahue, L. (2001). Impact of highly and less job-related diversity on work group cohesion and performance: A meta-analysis. *Journal of Management*, *27*(2), 141–162.

West, M. A. (2002a). Ideas are ten a penny: It's team implementation not idea generation that counts. *Applied Psychology: An International Review*, *51*(3), 411–424.

West, M. A. (2002b). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, *51*(3), 355–387.

White, K. M., Hogg, M. A., & Terry, D. J. (2002). Improving attitude-behavior correspondence through exposure to normative support from a salient ingroup. *Basic and Applied Social Psychology*, *24*(2), 91–103.

Wildschut, T., Insko, C. A., & Gaertner, L. (2002). Intragroup social influence and intergroup competition. *Journal of Personality and Social Psychology*, *82*(6), 975–992.

Williams, K., & O'Reilly, C. A. (1998). Demography and diversity: A review of 40 years of research. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 20, pp. 77–140). Greenwich, CT: JAI Press.

Wood, W., Lundgren, S., Ouellette, J. A., Busceme, S., & Blackstone, T. (1994). Minority influence: A meta-analytic review of social influence processes. *Psychological Bulletin*, *115*(3), 323–345.

Wozniak, S., & Smith, G. (2006). *iWoz: Computer geek to cult icon: How I invented the personal computer, co-founded Apple, and had fun doing it*. New York, NY: Norton & Co.

Wuchty, S., Jones, B. F., & Uzzi, B. (2007). The increasing dominance of teams in production of knowledge. *Science*, *316*(5827), 1036–1039.

Young, S. A., & Parker, C. P. (1999). Predicting collective climates: Assessing the role of shared work values, needs, employee interaction and work group membership. *Journal of Organizational Behavior*, *20*(7), 1199–1218.

Zairi, M., & Al-Mashari, M. (2005). Developing a sustainable culture of innovation management: A prescriptive approach. *Knowledge & Process Management*, *12*(3), 190–202.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, Monograph, Supplement*, *9*, 1–27.

Zellmer-Bruhn, M. E., Maloney, M. M., Bhappu, A. D., & Salvador, R. (2008). When and how do differences matter? An exploration of perceived similarity in teams. *Organizational Behavior and Human Decision Processes*, *107*, 41–59.

Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, *44*(4), 682–696.

TOWARD A THEORY OF RAPID CREATIVITY IN TEAMS

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ABSTRACT

Team creativity presents an interesting dilemma. On one hand, organizational teams are increasingly being asked to produce creative outcomes rapidly and within tight timelines. On the other hand, teams need sufficient time to explore different perspectives, play with ideas, and overcome the process losses that occur from working in interdependent groups. In this chapter, we address this dilemma by developing a model for understanding how teams can maximize the speed of the team creative process. We propose that teams' potential for rapid creativity is a function of aligning the team structure and standardization of the creative process with the team development cycle. When these three elements are aligned, teams are more likely to generate creative outcomes in a rapid manner.

Contemporary organizations confront a multitude of competitive pressures, ranging from increased globalization of markets, consolidation, technological change, and uncertain economic environments. In order to survive and prosper in spite of these pressures, organizations must be able to generate innovative products, practices, and services that enhance their competitive position in the marketplace (Kanter, 1988; Nonaka, 1991). In fact, organizational researchers have shown that a firm's innovative capacity is

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positively related to important outcomes such as profitability, product quality, and market value (Cho & Pucik, 2005; Nystrom, 1990). Considering that employee creativity provides the foundation for organizational creativity and innovation (Amabile, 1988; Van de Ven, 1986), it is essential that employees are creative in their work and that we, as organizational scholars, discover ways to enhance this creativity.

Concurrent with the increasing importance of creativity in organizations has been a shift from work organized around individual jobs to team-based work structures (Kozlowski & Bell, 2003; Ilgen, 1999). Considering that team-based work structures offer access to a diverse set of skills and perspectives, scholars have, and continue to, propose that organizing employees into teams is one valuable way of enhancing the creative capacity of the workforce (Amabile, 1996; Drazin, Glynn, & Kazanjian, 1999; Gilson & Shalley, 2004; Pearsall, Ellis, & Evans, 2008). Teams offer members the opportunity to interact with people from different backgrounds and who have different perspectives and approaches to their work. This diversity of viewpoints is thought to enable new pathways of thought and action and ultimately stimulate creative processes such as linking ideas from multiple sources and seeking novel ways of performing a task (De Dreu & West, 2001). Thus, one possible conclusion from this research is that organizations should seek to enhance creativity by furthering their use of team-based work structures.

On the other hand, there are several reasons why we might question the basic assumptions that team-based work structures enhance creativity. The most obvious is the "value in diversity" hypothesis, which research has drawn into question. For example, researchers have found that diversity can actually impede creativity by inducing within-team conflict and negatively influencing the exchange of ideas (Ancona & Caldwell, 1992; Pelled, Eisenhardt, & Xin, 1999; van Knippenberg, De Dreu, & Homan, 2004). Beyond this, however, is a dilemma involving issues related to time and efficiency. In order to survive, contemporary organizations must produce and select innovative ideas rapidly and within extremely tight timeframes (Christensen, 1997). Yet, research suggests that time to think creatively, explore different perspectives, and play with ideas is important for promoting creativity, and without sufficient time, creativity suffers (Amabile & Gryskiewicz, 1987; Andrews & Smith, 1996; Elsbach & Hargadon, 2006). In support of this assertion, Gilson and Shalley (2004, p. 467) suggest that "creativity on the job is still difficult due to time pressures to get the job done. It becomes easy to fall back on old routines." Unfortunately, the natural inefficiencies and process losses associated with team-based work structures and multiple people trying to combine their best efforts simultaneously should only exacerbate this problem. In brainstorming groups, where creativity is the explicit goal, these inefficiencies can be so severe that research has concluded creative processing may occur more quickly and effectively when carried out by individuals instead of teams (Mullen, Johnson, & Salas, 1991). This leaves us with the fundamental question of how can teams organize the creative process in order to rapidly generate creative ideas.

In this paper, we address this question by developing a model of rapid creativity in teams. Consistent with prior research, we conceptualize creativity as the production of ideas that are novel and useful to the organization (Amabile, 1996; Zhou & Shalley, 2003). Ideas are considered novel if they are unique relative to other ideas currently available in the organization, and usefulness is a function of how valuable the idea is to the organization. We conceptualize speed in terms of the amount of time consumed by the team creative process. Thus, rapid creativity is defined as the degree to which creative outcomes are achieved with minimal time requirements.

There are a number of examples of rapid creativity to be drawn from organizational life, but perhaps the most famous is the "Manhattan Project," an effort organized by the United States, United Kingdom, and Canada with the goal of developing an atomic bomb that would end World War II. This contentious top-secret project, initiated after it was revealed Nazi Germany was developing a nuclear weapon, brought together the foremost scientists of the day, from a wide array of nationalities and disciplines, and required what is still considered one of the most complex and ambitious coordination efforts in history – all under incredible time pressure (Kelly & Rhodes, 2007). Although the results of the project are highly controversial, it is heralded for achieving its goals in an astoundingly short period of time. Although few teams will ever be tasked with a project of such magnitude, work teams face many situations in which they must develop creative solutions to problems in very short periods of time. Indeed, in the modern workplace, where the speed of innovation is central to competitive advantage, many work teams do not have a choice but to create very rapidly.

Although the literature has been thoughtful about the impact of team dynamics, culture, and composition on team creativity, very little research has explored how these elements evolve over time. In fact, since most research on team creativity has examined teams at a single point in time, it seems likely that our current understanding of team creativity is bounded in

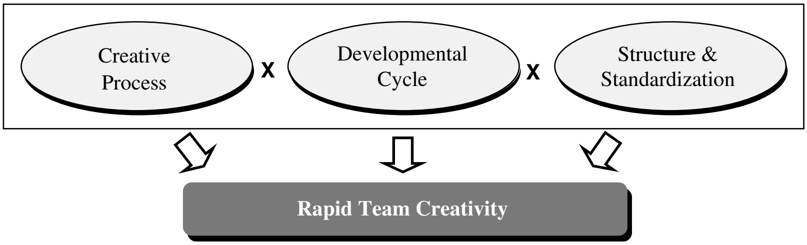

Fig. 1. Antecedents to Rapid Team Creativity.

time. This is important because team functioning differs across stages of team development, and we argue that a team's capacity for rapid production of novel and useful ideas is connected to the team's development. Specifically, as illustrated in Fig. 1, we propose that teams' potential for rapid creativity is enhanced by aligning three elements of team functioning: (a) team creative process, (b) team developmental phase, and (c) team structure and process standardization. In particular, we theorize that the appropriate team structure and standardization applied to the team creative process should be a function of the team's developmental stage. When these three elements are aligned, teams are more likely to rapidly generate creative ideas. To develop our model of rapid creativity in teams, we build upon and integrate theory on the creative process, team development, and team structure and process standardization to arrive at a process-oriented perspective of how teams can rapidly generate creative solutions.

KEY CONCEPTS AND TERMINOLOGY

We begin by delineating the key concepts and terms that we use in developing our theory of rapid creativity in teams. First, we specify how we are conceptualizing the team creative process. Because existing literature has generally focused on individual-level creativity processes (Shalley, Zhou, & Oldham, 2004), it is important that we first make explicit our assumptions about the team creative process. Second, since a key tenet of our theory is that how teams organize for rapid creativity will vary across the team development cycle, we then present a model of team development that provides the foundation for our theory building. Third, we identify and describe key elements of team structure and process standardization that help inform our theorizing about how teams should organize for rapid creativity. After discussing each of these individual components, we then present an integrative model that explains how these elements come together to form a theory of rapid creativity in teams.

Team Creative Process

Creativity as a process is concerned with the path toward producing creative outcomes, irrespective of whether the actual outcomes are deemed creative or not (Gilson & Shalley, 2004). Although recent literature has examined creative processes across individual, group, and organizational levels of analysis (e.g., Drazin et al., 1999), most theory and research on the creative process has been conceptualized at the individual level. For example, Torrance (1988) suggested that creativity is a process of individuals sensing problems, making guesses, formulating hypotheses, communicating ideas to others, and contradicting conformity. Similarly, Amabile (1988, 1996) modeled creativity as an individual-level cognitive process consisting of multiple stages. We use Amabile's model of creativity as a starting point for our own theorizing because of its explicit discussion of the link between individual- and team-level creative processes.

Amabile (1988, 1996) assumes individual- and team-level creative processes to be of similar composition, since both involve cognitive processes of idea generation and idea testing. We make a similar assumption. For example, individuals might develop ideas on their own, present these ideas to the team, refine these ideas via group discussion, continue thinking about and refining the ideas on their own, and then return to the team to further modify the ideas. In this sense, team-level creativity processes involve individual-level acts of creativity as well as team-level interaction and coordination. Moreover, in team contexts, it is often difficult to differentiate the input and contributions of individuals from those of the team (Sutton & Hargadon, 1996). This interplay between individual-level acts and team-level processes has led researchers to conclude that teams go through a creative process that is similar to that of individuals. According to Amabile (1996), this process consists of five stages: (a) problem and task identification, (b) preparation, (c) response generation, (d) response validation and communication, and (e) idea selection. According to this process, teams identify a problem requiring creative ideas and then begin to prepare by developing new knowledge or reactivating stored knowledge that is relevant to the particular problem set. Teams then engage in a search process whereby they generate as many novel and potentially useful ideas as possible. Once a set of possible ideas has been established, the team then shares those ideas within the team and begins to evaluate the ideas against factual knowledge or other criteria that enable a judgment of novelty and usefulness. Upon evaluating the ideas, a creative idea is selected or the process is initiated again.

Engagement in this creative process has been suggested as a critical activity for team success (Drazin et al., 1999), and a small body of empirical research supports this assertion (e.g., Leenders, van Engelen, & Kratzer, 2003; Taggar, 2002). However, we propose that there are certain nuances in the team creative process that are not currently addressed in the existing research. For example, research suggests that teams should adapt their processes in ways that account for the natural evolution of team development (Kozlowski, Gully, Nason, & Smith, 1999; Marks, Mathieu, & Zaccaro, 2001), and it seems reasonable to assume that how teams approach the creative process might vary depending on the team's developmental stage. Moreover, it is unclear from the existing literature how different strategies, structures, and approaches to the creative process impact the team's capacity to produce creative outcomes, and the extent to which teams do so rapidly. In sum, the extant literature provides a rich descriptive account of the creative process, but we have a limited understanding of how teams should organize the creative process, what factors influence these choices, and how these choices influence how fast teams generate creative outcomes.

Team Development Cycles

Much of the research on team creativity has occurred in laboratory settings where team members often have no prior history with each other, no established patterns of interaction, no knowledge of each other's unique skills or expertise, and a weak incentive to create a mutual understanding among team members (Kurtzberg & Amabile, 2000). Although this research design is sufficient for many questions related to team creativity, the context of this research does limit our understanding of team creativity in important ways. In particular, current research does not address how team creative processes evolve over time, or how these creative processes operate at different stages of the team's life cycle (Shalley et al., 2004).

The extant literature consists of many different conceptual models of team development. Kozlowski et al. (1999) conducted a review of the team development literature, and, based on this review, developed a model of team development that provides a conceptual integration across the existing theories and perspectives in the literature. In this model, Kozlowski et al. suggest that there are four general phases of team development: (a) team formation, (b) task compilation, (c) role compilation, and (d) team compilation. To date, no research has explicitly examined how the team creative process operates across these four phases, but there are several insights about team creativity and development that we can surmise from existing research.

In the *team formation* phase of team development, team members are primarily focused on seeking information and learning about other team members. Developing this social knowledge and resolving any interpersonal issues must occur before individuals will devote sufficient attention to work tasks – such as creating novel and useful ideas (Feldman, 1981; Katz, 1980). This is also the stage of team development where teams establish their shared climate perceptions and common goals. Considering that shared goals and climate perceptions are important predictors of creative processing (Shalley & Gilson, 2004), this first phase of team development should have considerable influence in shaping the team creative process. In particular, to establish a context supportive of creativity, it is likely important that team members be allowed to socialize, disclose interpersonal knowledge, and build strong interpersonal relationships during the formation phase.

In the second phase of team development, which is referred to as *task compilation*, team members shift their attention toward their own task proficiency and competence. Although individuals coordinate with the activities of others, team members are primarily self-focused on their individual task performance during this phase. It is critical during this phase that the team norms, climate, and goals established in the prior stage be reinforced, but the natural focus of team members is on establishing competence with respect to their own individual task elements. In terms of the creative process, given the importance of building individual task competence at this stage, teams should likely be organized in such a way that takes advantage of the focus on individual task elements while also reinforcing team norms and a supportive climate for rapid creativity.

The third phase of team development is called *role compilation*. In this stage, team members develop an understanding and appreciation for the mutual coordination requirements between themselves and others in the team. At this point in the team's development, team members differentiate and formalize their role in the team and learn how their role relies on and informs other roles in the team. This is the point in the team process where team members learn to pace, sequence, and time their respective behaviors. The role knowledge developed here is generally dyadic in nature; in other words, team members develop a rich appreciation for the dyadic interdependencies with other individuals in the team but do not establish a well-developed understanding of how the team as a whole works. In terms of facilitating a rapid team creative process, teams in this phase would likely benefit from a structure and process that emphasize role differentiation but do so in such a way that makes clear how the roles are linked.

In the final phase of team development, called *team compilation*, team members begin to view the team as a system of role networks linked by complex task interdependencies. By this point in the team's development, team members have not only developed social norms and processes, but task-related processes are also well established and embedded in the team's culture. It is at this point when team members are able to work together without significant process loss and do not require a great deal of direction or oversight with respect to specific team processes. As a result, teams in this final stage of development will likely be most capable of rapid creativity when allowed to determine and adapt their own processes and approaches to organizing the creative process. Organizing the team creative process in this way will likely take advantage of the creative benefits of autonomy and flexibility while also realizing some of the efficiencies associated with team self-management (Manz & Sims, 1987).

Team Structure: Centralization and Departmentation

Although team development cycles will shape how teams should organize for rapid creativity, we posit it is through team structures and process standardization that teams adapt to different development cycles such that they are able to achieve rapid creativity. To conceptualize team structure, we draw from Burns and Stalker's (1961) theory of mechanistic and organic organizational forms, which conceptualizes team structure along two dimensions: centralization and departmentation (Wagner, 2000). *Team centralization* reflects whether authority and decision rights are concentrated or held by a single member of the team (e.g., the team leader), or whether authority and decision rights are dispersed such that team members have significant autonomy in making decisions (Pugh, Hickson, Hinings, & Turner, 1968). *Team departmentation*, on the other hand, reflects the degree to which team members' formal roles are specialized functionally (i.e., a functional team structure), or whether team members' roles are as undifferentiated generalists where expertise is shared among team members (i.e., a divisional team structure). These two forms of departmentation speak to how a team's task role and responsibilities are organized, with the key difference being that in a functional team structure, team members are responsible for specific, individualized tasks; in a divisional team structure, team members are responsible for a variety of tasks, therefore requiring greater interdependencies among team members in order to complete tasks (Hollenbeck et al., 2002). These structural forms are independent of team members' individual skills or areas of expertise, although they may often be aligned. The centralization and departmentation dimensions of team structure form the basis for structural contingency theory, which suggests that these structural dimensions differ in their fit with various task environments and, as a result, differentially impact performance outcomes (Drazin & Van de Ven, 1985; Hollenbeck et al., 2002).

Prior research has established that features of the team context – in particular, team composition and task design – are important antecedents to team creativity (e.g., Gilson & Shalley, 2004). However, team structure as a feature of the team and its potential influence on creativity has not been considered. Nonetheless, there are insights from existing research on team structure that suggest these structural concerns might be important for developing a theory of rapid creativity in teams. For example, the degree of centralization in the team should be an important dimension of structure for team creative processes, given that autonomy is often associated with higher levels of creativity (Amabile et al., 1996; Zhou, 2003). Thus, it might be the case that decentralizing control over certain aspects of the team creative process will promote greater creativity, and there is some evidence to suggest that decentralized structures enhance the speed and efficiency of team processes (Faucheux & Mackenzie, 1966; Shaw, 1981; Turner, 1992). On the other hand, the extent to which the team creative process can be decentralized without launching the team into a state of chaos likely depends on the team's developmental phase.

With respect to team departmentation, structures that promote functional specialization are often associated with higher levels of speed and efficiency than are divisional, undifferentiated structures. On the other hand, divisional structures are typically seen as more adaptive when faced with novel and disruptive situations – such as those requiring creativity and problem solving (Hollenbeck et al., 2002). Thus, based on prior research, it seems that both dimensions of team structure – centralization and departmentation – will shape the extent to which teams can generate creative solutions in a rapid manner. Nonetheless, it is clear from existing research that there is no single best team structure for all task environments, and we expect that the most appropriate team structure will vary across the creative process and team life cycle.

Process Standardization

The standardization of work practices is often employed to improve unit performance by reducing the variance in how work is performed; or, in other words, standardizing the approach to work across people, places, and time (March, 1991). In recent years, organizations have begun to standardize work practices and processes in teams so that individual team members have a common approach for how work is to be performed in the team (Vogus & Welbourne, 2003). This standardized approach to teamwork aims to enhance team performance by minimizing ambiguity, managing complexity, avoiding costly mistakes, and ensuring that accurate work strategies are followed by all team members.

Traditionally, creativity and standardization have been assumed to be antithetical. Creativity scholars often frame and discuss creativity as a process of change and adaptation in response to environmental uncertainty. In fact, theories of creativity champion the idea of creating as many novel and unique ideas as possible for how to get work accomplished, and experimenting with new and different strategies is the norm rather than the exception in the creative process. On the other hand, standardization is derived from Taylor's (1911) views on scientific management and suggests that routinization is the key to coping with environmental uncertainty and complexity. From this perspective, performance is enhanced when the variation in work practices is reduced and consistently applied and adhered to across people, time, and place.

Despite the seemingly contradictory nature of creativity and standardization, there is some research that suggests the two are not mutually exclusive and can actually complement each other (Feldman & Pentland, 2003; Gilson, Mathieu, Shalley, & Ruddy, 2005; Shank, Niblock, & Sandalls, 1973). For example, Gilson and colleagues (2005, p. 523) found that a combination of creativity and standardization led to higher team performance than either creativity or standardization on its own, leading the authors to suggest that "high levels of creativity combined with low levels of standardization may result in chaos and not be all that beneficial." We concur that creativity and standardization can be complementary, but we also posit that there is a more nuanced connection between the two concepts. In particular, for achieving rapid creativity in teams, we expect that the optimal degree and form of process standardization varies across the team creative process. We also expect that the importance of standardization will vary across the team development cycle. We propose that there is an appropriate fit between standardization and the team development cycle, and that this notion of fit unveils a more complex interplay between standardization and the team creative process that helps explain the disparate research findings on this topic in the literature.

AN INTEGRATED MODEL OF RAPID CREATIVITY IN TEAMS

The notion of rapid creativity presents teams with an interesting dilemma. Whereas time is a finite and highly constrained resource given the pace of change and innovation in contemporary organizations, the team creative process requires sufficient time to play with ideas and explore different perspectives (Shalley et al., 2004). This dilemma provides the motivation for our theorizing – if teams need time to be creative but time is highly constrained, then how should teams organize such that they are able to pursue and develop creative outcomes in a timely manner?

We posit that one possible answer to this question is grounded in understanding how teams can best structure and organize the team creative process according to the team development cycle. Specifically, we theorize that the appropriate team structures and degree of process standardization in the team creative process ought to be determined by the team development cycle, and that alignment among these elements provides the necessary conditions for teams to rapidly produce creative outcomes. In this sense, team structure and process standardization serve as "dials" that teams can manipulate in ways that help facilitate a rapid team creative process. To develop the theoretical rationale for these arguments, we organize our discussion by the four phases of team development. For each phase of team development identified by Kozlowski and colleagues (1999), we posit that there are optimal team structure and process standardization strategies that will facilitate rapid creativity. Our core propositions are summarized in Fig. 2.

There are several assumptions implicit in our model, many of which illuminate important boundary conditions for our theorizing and that are important to clarify before presenting our framework. First is the assumption that the time required to move through the team creative

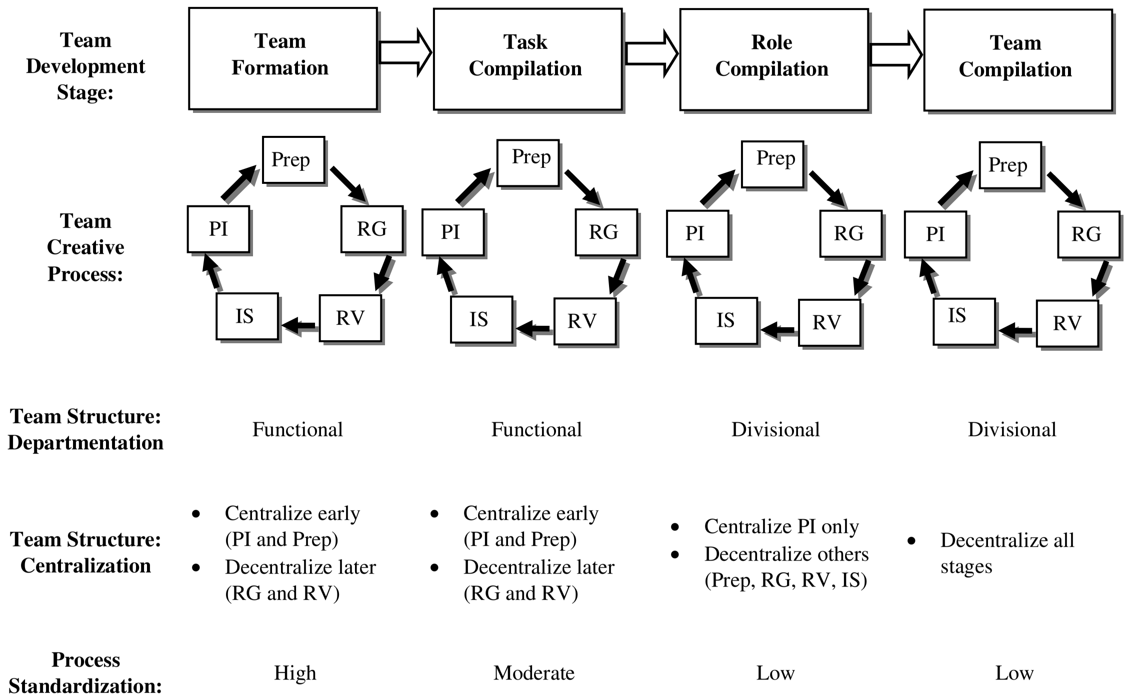

Fig. 2. Organizing for Rapid Team Creativity. *Note*: PI = problem and task identification; Prep = preparation; RG = response generation; RV = response validation and communication; IS = idea selection.

process is independent of the time it takes to progress through the team development cycle. In other words, teams may engage in and complete creative projects (or even several) without necessarily progressing to the next phase of team development. Conversely, teams may move through team development phases without completing a full cycle of the team creative process. We also assume that teams can be creative at any phase of the team development cycle, but that they do so in different ways and therefore should organize the team structure and process according to the unique challenges and opportunities present in each distinct phase of development. Therefore, we orient our model toward how the team creative process should be structured and standardized in order to optimize the speed of the creative process at each phase of team development.

A related assumption is that teams are able to voluntarily change their structures and approaches to standardizing the creative process to fit the developmental phase they are in. This approach emphasizes teams' abilities to react and adapt to the demands of the task and/or environment. Research on team structure supports this assumption, suggesting that not only are team structures such as departmentation and centralization malleable in teams, but that adapting these structures to fit the task environment actually enhances team performance (e.g., Hollenbeck et al., 2002; Ellis, Hollenbeck, Ilgen, & Humphrey, 2003; Moon et al., 2004).

Similarly, our model assumes that team structure, standardization, and team development are independent. As noted earlier, we presume that different team structures may be employed by a team at any point during the team's development, and although the team structure may aid (or hinder) the team development process (e.g., by providing opportunities to develop social knowledge or make role interdependencies more apparent), teams may employ different structures at any given stage of development.

Although we develop our theory of rapid team creativity in such a way that follows the team development cycle linearly, from the infancy of new teams to the maturity of established teams, we are not implying that teams always start at the beginning of this life cycle and follow it through the end. Surely, many teams engaging in a creative project will bring preexisting skills, knowledge, and experiences that will shape the team process and advance the team's capacity for rapid creativity. Other teams may unexpectedly need to step backward or begin the process again. Thus, we assume that teams may enter the process we outline at any point in the development cycle. In addition, there may be feedback loops that impact team development or the creative process. For example, if the creative process is structured in such a way that diminishes or suppresses the contributions of certain members, resulting conflict may force the team back into earlier stages of the creative process before it can generate an effective solution, thereby slowing the creative process.

Finally, we build our model of rapid creativity in teams with the assumption that it can be applied to a wide variety of different team types and tasks. Although the majority of the research on creativity in teams has focused on teams specifically tasked with generating novel solutions to specific problems (e.g., product development teams), many different types of teams may engage in the creative process, regardless of whether creativity is the explicit goal of the team. For example, a quality control team may find itself developing a new approach to its work, even though the team's stated goal is focused on quality and not creativity. We therefore aim to develop a theory of rapid creativity that applies to any team engaging in the creative process. Likewise, our theoretical model is likely applicable to both short- and long-term teams. Whether a team performs together for a single task episode or over multiple task episodes, we expect the same processes and organizing principles to facilitate rapid team creativity.

Phase 1: Team Formation

The focus of teams during the formation phase is primarily on developing social knowledge among team members and establishing shared norms, climate perceptions, and goals. During this stage, the nature of the team, its goals, and the fit of individuals within it have not been established, thus creating a high degree of social uncertainty. This social uncertainty has several important implications for team creativity. In particular, team members do not have a well-developed understanding of other team members' areas of expertise or creativity-relevant skills and experience. Based on prior research documenting the value of diversity and transactive memory for creativity (Kurtzberg, 2005; DeDreu & West, 2001; Kurtzberg & Amabile, 2001; Sutton & Hargadon, 1996), we expect that this lack of understanding about other team members limits the team's ability to rapidly draw from its sources of expertise and therefore hinders the team's ability to rapidly generate creative outcomes. Moreover, teams in this stage do not yet have a shared climate for creativity or norms for how the creative process should flow, both of which have been positively linked to the production of creative outcomes (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Gilson & Shalley, 2004).

In response to this social uncertainty within the team, individual team members are likely to focus on trying to make sense of their new work and team environment (Louis, 1980). Until shared norms, climate perceptions, and interpersonal knowledge are developed, team members will have difficulty focusing on their tasks in a productive and rapid manner. Thus, in terms of facilitating rapid creativity, it is essential that the team creative process be structured and organized in a way that facilitates mutual understanding within the team regarding team members' creativity-relevant skills, abilities, and attitudes, as well as the development of shared norms and climate perceptions related to creativity. Newly formed teams, such as those studied in prior laboratory research (e.g., Taggar, 2002), may arrive at creative outcomes without these elements in place, but we expect these teams do so in a manner that is slower and consumes greater use of team resources than would otherwise be required.

To overcome the barriers to rapid creativity during the team formation stage, we posit that teams should be organized in a *functionally specialized* structure where team members interact and work together in ways that maximize the saliency of their respective functional expertise, skills, and knowledge. This form of departmentation should help facilitate a shared understanding among team members regarding their unique contributions to the team creative process, and help reduce social uncertainty in the team by requiring team members to be highly interdependent in their work. Moreover, because of the high degree of interdependencies introduced by a functional departmentation, we expect teams will quickly develop shared norms and climate perceptions about the creative process. This is in contrast to a less differentiated, divisional team structure where functional expertise is not as salient and the interdependence between team members is less. Although these outcomes do not represent creative results per se, they must be established and resolved before the team will be able to rapidly generate creative outcomes.

Given that teams in this formation stage probably have not worked together in the past and norms for the creative process are not in place, we also propose that decisions and authority related to the initial stages of the creative process, namely *problem identification* and *preparation*, should be centralized. Given the lack of experience working together on creative tasks and the high degree of social uncertainty present during this stage of team development, identifying the problem and preparing the team to rapidly draw from its resources and expertise will be quite difficult for the team to do on its own. A shared understanding of the problem and how team members should interact to address the problem will likely be hard to come by in newly formed teams, and thus it will be more efficient for the *early* stages of the creative process to be centralized in newly formed teams. On the other hand, we posit that the *later* stages of the creative process, especially *response generation* and *validation*, should be decentralized. Team members' motivation to be creative increases the more they feel empowered and autonomous during the creative process (Gilson & Shalley, 2004), so decentralizing responsibility for the later stages of the creative process ought to provide team members with the desired autonomy and freedom for creativity. Moreover, by decentralizing the response generation and validation processes, team members are indirectly encouraged to work together, share and debate their unique perspectives, and integrate others' perspectives with their own, all of which should help reduce social uncertainty and facilitate the development of shared norms and climate perceptions in the team, factors which have been shown to lead to creativity in work teams (Hargadon & Bechky, 2006).

Despite the benefits of a functional and centralized team structure for rapid creativity in newly formed teams, neither of these structural choices addresses the fact that team members during this stage do not share a common way of approaching the creative process. We assume in our theorizing that a common approach among team members to the creative process is a necessary condition for rapid creativity, because of the importance of shared mental models in enabling teams to quickly generate effective solutions. When this common approach is not present, as with newly formed teams, we expect teams will need to formulate and adopt standardized practices for the team creative process. Standardizing the team creative process may require an initial use of team resources that detracts from the speed of the creative process, but in the long run, there are several reasons why the time and energy put toward developing a standardized approach for team creativity will pay off with more rapid generation of creative outcomes.

During the formation stage, team members put less focus on the task of generating creative outcomes and instead devote more attention and cognitive resources to developing social knowledge and relationships. Thus, standardizing the creative task-related processes should reduce the cognitive demands of the creative task and reduce the inefficiencies introduced into the process by team members' preoccupation with interpersonal issues. Second, standardizing *all facets* of the team creative process during this stage should help facilitate the development of shared norms and guidelines for rapid creativity. Sutton and Hargadon's (1996, p. 694) study of the firm IDEO noted that creativity was enhanced by adopting rules such as

"(1) defer judgment, (2) build on the ideas of others, (3) one conversation at a time, (4) stay focused on the topic, and (5) encourage wild ideas." We posit that standardizing the team creative process according to similar guidelines will ensure they become institutionalized as normative procedures in the team, and as a result, enhance the speed with which teams generate creative outcomes going forward. These standardized processes might include specific guidelines for identifying the problem and its key components, a standard approach for identifying key centers of expertise within the team, or specific validation metrics and protocols for evaluating ideas for their novelty and usefulness. Finally, greater standardization of the team creative process should help develop a climate for rapid creativity where team members collectively come to believe and value the idea that an organized and deliberate team creative process not only promotes creativity but also efficiency.

In sum, we posit that a functional team structure, centralization of early phases of the team creative process, decentralization of later phases of the team creative process, and a high degree of standardization throughout the creative process will help teams in the formation phase of development and generate creative outcomes more quickly. Moreover, these structural and organizing principles should help develop a set of informal norms and processes that enable a more rapid team creative process as the team evolves and develops over time.

Phase 2: Task Compilation

In the task compilation phase of team development, team members have resolved much of the social uncertainty in the team and, as a result, shift their attention toward their own individual task responsibilities. At this stage of the team life cycle, team members still do not have a deep understanding for how their individual task elements fit together, and the focus on their own tasks has important implications for how teams should organize for rapid creativity. Most importantly, the team structure and the degree of standardization in the team creative process should support the individual-level task focus of team members while at the same time establishing a foundation for more coordinated creative acts.

In terms of the departmentation structure, we posit that teams in the task compilation phase should maintain a *functionally specialized* structure where individuals can focus on generating creative ideas based on their own unique knowledge and expertise. This functional structure could be enacted by having team members generate ideas individually, or team members could be organized into subgroups consisting of individuals with similar backgrounds and expertise. These homogenous subgroup structures are considered efficient in the task compilation phase, but not in the team formation phase, because of the social knowledge that has now been established among team members. Maintaining this functional structure enables individual team members to focus on generating ideas based on their own domain of expertise. By designing the team structure in such a way that allows team members to focus on their own task elements, the creative process should unfold more rapidly than if team members were forced to consider the broader interdependencies between individual task elements. However, a functional structure also requires that team members come together during the validation and idea selection phases of the team creative process to share and debate their unique perspectives on why certain ideas are more or less creative. This process of integrating unique perspectives should help facilitate a common understanding among team members regarding how their respective domains of expertise and knowledge are interdependent and complement each other in the generation of novel and useful ideas. Thus, not only should a functional team structure during this stage of team development lead to a rapid team creative process, but the structural choice also helps move team members beyond their current individual focus and facilitates a richer understanding of the team.

Similar to teams in the formation stage, we expect that teams in the task compilation phase will achieve a more rapid team creative process if they maintain a balance between centralization and decentralization. Establishing a common problem definition and clearly identifying individuals' functional domains of expertise and knowledge are essential for facilitating rapid creativity in teams. Given that team members are focused on their individual task responsibilities during this stage and still do not have a rich understanding of the interdependencies between individual components of the team, we posit that the *problem identification* and *preparation* stages of the creative process should continue to be centralized. Centralization of these early phases of the team creative process should help the team more quickly develop a common frame for the team creative task and a more accurate understanding of team members' unique perspectives and contributions. However, once a common problem definition has been established and functional domains of expertise identified and structured accordingly, the team creative process should be decentralized so that team members have autonomy over *idea generation* and *validation* processes. Not only is this important for motivating team members to generate more creative ideas, but decentralization should also help facilitate the evolution of team members' understanding of how individual elements of the team fit together. Decentralization will require that team members listen to and integrate others' perspectives in order to arrive at a collective decision regarding which idea(s) are most creative.

Although we expect that the optimal departmentation and centralization structures will be similar across the formation and task compilation phases of team development, we expect that the task compilation phase offers an opportunity to reduce the formal standardization associated with certain aspects of the team creative process. We initially proposed that a high degree of standardization throughout the team creative process was appropriate during the formation stage. As a result of this standardization, team members should have begun to develop common norms and guidelines for a rapid team creative process. Thus, in the task compilation phase, our aim is to reinforce these norms and guidelines while also reducing the amount of formal standardization required to facilitate the team creative process. Our assumption is that if we can reduce the amount of formal standardization required without incurring any increased process losses in the team, the speed of the team creative process will be enhanced. We expect that this can be achieved by maintaining standardized protocols and practices for the early and late stages of the team creative process, but reducing the formal standardization present in the intermediate steps of the team creative process. The early and late stages of the team creative process, namely the *problem identification*, *preparation*, and *validation* stages, are susceptible to inefficiencies. This is because team members do not have a common frame of the team problem or understanding of how the individual components of the team best fit together to generate creative outcomes. Standardized processes and practices can help overcome these inefficiencies. On the other hand, at this point in the team's life cycle, the *response generation* stage of the team creative process should be able to occur in a rapid manner without formal standardization. The norms and guidelines developed in the formation stage, combined with a functional and decentralized structure, should enable team members to rapidly generate creative ideas.

In sum, we expect the team creative process to be most efficient during the task compilation phase of team development when teams maintain a functional team structure, centralize early phases of the team creative process, decentralize later phases of the team creative process, and relax the degree of standardization during the intermediate steps of the creative process (e.g., response generation).

Phase 3: Role Compilation

The degree to which team members recognize the interdependencies between their role in the team and other team members' roles is the distinguishing factor of the role compilation phase. In this phase, team members develop a rich understanding of the mutual coordination requirements between themselves and others in the team, and are especially aware of how others' roles in the team are differentiated from their own. This focus on role differentiation among individuals in the team has several important implications for how teams should organize for rapid creativity. First, the team structure and organizing principles should emphasize the dyadic interdependencies among team members' roles as they relate to generating and evaluating creative outcomes. Second, team members' knowledge and understanding of their role in the team and how their role fits with other roles in the team offers an opportunity to enhance efficiency by granting team members with more control and authority over the team creative process. This is in stark contrast to earlier phases of team development, where team members had a more limited sense for how the individual components of the team fit together.

The major evolution in the team creative process during the role compilation phase should come in the form of team structure. We do not expect the increased focus on role differentiation to reduce the need for standardized practices and approaches during the early and late stages of the team creative process, nor should this aspect of the team's development require any additional standardization during the intermediate steps of the creative process. Thus, we propose maintaining a moderate amount of standardization where the *problem definition*, *preparation*, and *validation* phases are accompanied with formal standardized practices, but the *response generation* process is subject to less formal standardization. In terms of team structure, however, we propose that there are several changes that should occur for teams entering the role compilation phase of team development.

First, in terms of departmentation, teams should move to a more undifferentiated, divisional structure where team members are organized not as functional specialists but rather as generalists who are expected to integrate across functional domains to more rapidly generate creative outcomes. This departmentation structure should enhance the speed of the team creative process for two reasons. The first reason is that, in comparison to specialized team structures, divisional structures enhance communication and information sharing between functional domains and thus should enable more effective coordination across these domains in generating creative outcomes. The second reason is that divisional structures enhance the team's ability to adapt to novel and complex environments. Situations requiring creativity are often described as novel and complex (Oldham & Cummings, 1996), and so in the role compilation phase, a divisional team structure should enable the team to generate creative outcomes with minimal loss of time and resources.

In terms of centralization, we propose that teams should move to a more decentralized structure where the *problem identification* process is centralized but all other phases of the team creative process are decentralized. It is important to centralize the problem identification phase because team members, even in the role compilation phase, do not have a rich understanding of how external events and problems impact the team as a whole. Instead, team members focus on the implications for their role in the team and how their role connects to others' roles in the team. In this phase, team members are still not capable of viewing the team as a whole unit. Thus, it is important that the team develops a common understanding of the problem before engaging in the creative process, and centralization of the problem identification task offers an efficient way of accomplishing this. Once the problem has been identified and the parameters of the creative process defined, we propose that the rest of the team creative process (*preparation*, *response generation*, and *validation and selection* of an outcome) should be decentralized. The already established norms and climate for creativity, combined with greater autonomy in the creative process, should enhance the speed with which teams generate creative outcomes. Team members should be more intrinsically motivated to engage in the creative process, and the established norms and climate for creativity should provide the necessary direction required to more quickly transform these motivational resources into creative outcomes.

In sum, for teams in the role compilation phase, we propose that a divisional structure combined with moderate standardization and minimal centralization will result in the most rapid generation of creative outcomes for the team.

Phase 4: Team Compilation

The final phase of team development is team compilation. By this stage, team members have acquired a rich understanding of and appreciation for the complex role linkages and interdependencies in the team. This is the developmental stage where team members begin to view the team as a system of interdependent roles and networks. Because of this knowledge, teams are able to maintain the coordination and pacing required for adjusting to novel task demands and synchronizing the sequence of activities to avoid bottlenecks and overload situations. In terms of team creativity, this ability to collectively balance workload among team members and monitor internal team processes contributes to a team's ability to dynamically adapt the team creative process in ways that can maximize speed. Moreover, teams in this phase are able to self-manage without much outside intervention. Considering that self-managing teams are often considered more efficient than teams with formal centralization of leadership or oversight (e.g., Manz & Sims, 1987), we propose that team structure and standardization processes should be organized such that teams in this developmental phase are fully autonomous units with few boundaries between team members.

In terms of team structure and departmentation, we expect that maintaining the undifferentiated, divisional team structure established in the role compilation phase will maximize the speed of the team creative process in this phase as well. As stated previously, we expect the team to have already established norms for working together and a climate that supports rapid creativity. These features of the team were established in the earlier phases of the team life cycle. The speed with which teams coordinate the creative process should only increase in the team compilation phase, as team members operate with a greater understanding of the nuances for how team members' roles are interdependent and interact to generate creative outputs. Moreover, by minimizing the functional boundaries between team members, an undifferentiated, divisional team structure should enable team members to more quickly manage and adapt the team creative process for any particular problem requiring creativity.

Similarly, we propose that decentralizing and not imposing any formal standardization on the team creative process will maximize the speed with which teams in the team compilation phase generate creative outcomes. By this point in the team's life cycle, the team has well-established norms and guidelines for how to facilitate the team creative process. These informal norms and guidelines, when combined with well-developed mental models for team functioning, should maintain the order necessary for a rapid creative process. Because there are no constraints put on the team in terms of formal standardized practices or processes, we expect these teams will generate creative outcomes more rapidly than teams who require standardization in order to minimize the variation in approaches to the team creative process. Moreover, decentralizing decision rights and control of the team creative process should not only increase team members' motivation to generate creative outcomes, but also enhance the efficiency of the process for teams in the team compilation phase. This is because teams in the team compilation phase are able to quickly coordinate and integrate the creative acts of individual team members and respond flexibly to the external environment.

Boundary Conditions to Rapid Creativity in Teams

There has been a great deal of research on understanding the social and contextual factors that serve as boundary conditions to the creativity of individuals, teams, and organizations (see Shalley & Gilson, 2004, for a review). While many of these same factors likely influence our theorizing regarding rapid creativity in teams, there are several potential boundary conditions that seem particularly important given the key assumptions that we make in our theory building. The first assumption worth noting is that we assume teams have the option of centralizing aspects of the team creative process to a central figure in the team who has a broader understanding of the unique contributions and interdependences across individuals and roles in the team. However, it is certainly the case that not all teams will have this luxury. Thus, based on this assumption, we posit that the presence or availability of a formal team leader during the early stages of team development will enhance the speed and overall effectiveness of the team creative process. There is a considerable body of research suggesting that formal team leaders are extremely important for facilitating team processes under novel conditions where team members do not have a well-established response to external or internal stimuli (Morgeson, 2005; Morgeson & DeRue, 2006). The team creative process during early stages of team development offers one such situation. For example, communicating and integrating different perspectives is important for team creativity, and team leaders are in a unique position to integrate across team members' perspectives and contributions when the team is unable to efficiently do this on its own. Moreover, we expect that team leaders who are effective at establishing team norms, a climate for creativity, and common goals for creativity within the team will help facilitate the team's development toward more efficient self-management of the team creative process.

Another implicit assumption we make is that team members' interaction is largely unconstrained in that team members are free to interact with each other in ways that reduce social uncertainty and develop interpersonal knowledge. This is important because the base assumption underlies the expectation that teams will develop shared norms and climate perceptions over time. However, as organizations become more global and work groups more dispersed in space and time, team functioning is increasingly occurring through virtual technologies (e.g., email, phone, videoconference), sometimes more so than traditional face-to-face interactions (Kirkman, Rosen, Tesluk, & Gibson, 2004). Unfortunately, the evidence on team virtuality suggests that this increase in virtual interaction may actually limit the degree to which team members are able to reduce social uncertainty and develop shared norms and perspectives (Lipnack & Stamps, 2000; Maznevski & Chudoba, 2000). Thus, we expect that teams operating primarily via virtual means will find it more difficult to rapidly generate creative outcomes; we also expect that these teams will find it more difficult to develop the self-management capabilities required for rapid creativity. We posit that this is especially true for developmental transitions related to role and team compilation, where team members need to experience the interdependencies and linkages between team members' roles and responsibilities in the team.

Next, although we expect most teams to generally follow the progression of the creative process and team development cycles suggested here, it is quite possible that there may be feedback loops and disjunctures in these processes. For example, with regard to the team creative process, a team may find itself abandoning the path they are on and beginning the creative process from scratch, particularly after the introduction of new information, team members, or external demands. Other teams may find themselves skipping stages of the creative process due to factors such as team members' knowledge or authority structures in the team. With regard to the team development cycle, it is also possible to imagine a variety of scenarios in which teams may not progress linearly. For example, teams that have worked together in the past and/or on similar projects would likely start at a more advanced stage of team development. We expect nonlinear patterns and feedback loops of this sort to affect the speed with which teams are capable of generating creative ideas, and thus encourage other scholars to explore these nonlinear, feedback loops in future research.

The final assumption we draw attention to is that we do not model the possibility that team membership can actually change over time. There are several reasons why changes to team composition might influence our model of rapid creativity in teams. First, there is some evidence suggesting that the majority of creative ideas originate within the individual mind and not as a function of the group process (Triandis, Bass, Ewen, & Mikesell, 1963).

From a similar perspective, there is empirical evidence suggesting that individual differences such as cognitive ability and personality traits (e.g., openness to experience, conscientiousness) explain how and to what extent teams generate creative ideas (Taggar, 2002). Thus, the loss of team members who possess attributes vital to the creative capacity of the team should have a negative impact not only on a team's ability to generate creative outcomes, but also on the speed of the creative process. With respect to adding team members, irrespective of their individual capabilities, new team members require socialization for a smooth transition into the team (Ericksen & Dyer, 2004). This socialization process requires attention and cognitive resources that could otherwise be applied to the team creative process. Thus, engaging in socialization for new team members should detract from the efficiency of the team creative process, thus leading to less rapid creativity. Moreover, introducing new members into the team will likely create a situation where team members do not share mental models of team functioning and ultimately impede the team's development. In our theorizing, we assume that team members develop their shared understanding of the team creative process at the same rate and without disruption. However, we expect that changes in team membership will ultimately reduce the speed of the team creative process.

DISCUSSION

The theory we have put forth on rapid creativity in teams contributes to the extant literature on team creativity in several important ways. First, scholars have noted the need for additional research on the process by which teams engage in and generate creative outcomes (Amabile, 1996; Shalley et al., 2004; Gilson & Shalley, 2004). Most of the existing literature examines creativity as an outcome, without making explicit the processes by which the outcome is achieved. The present theory attempts to extend Amabile's (1996) description of the creative process by articulating how the team development cycle, team structure, and standardization of the creative process provide insight for how teams can generate creative outcomes more rapidly. In this sense, our theory offers a more nuanced view of the team creative process by specifying how the creative process may vary under different conditions of team development, structure, and standardization.

Related to this is the fact that prior research has identified a multitude of team characteristics and processes that shape a team's capacity to generate creative outcomes. Some of these factors include team composition, shared goals, rewards, organizational support, and psychological safety (Shalley & Gilson, 2004; Kurtzberg & Amabile, 2001). Despite the promising insights generated from this research, issues related to team development and structure, and how these features of the team shape the team creative process, have gone unexplored. In terms of team development, this is an especially important gap in the literature because the team development cycle is likely to influence the creative acts of individuals as well as the interactions among team members that are important for determining team creativity. The same is true for team structure, given that structural concerns influence the speed with which teams execute tasks and adapt to novel, complex situations.

The present theory also contributes to our understanding of the team creative process by repositioning the role of time in how we model and conceptualize creativity. Most of the existing literature on time and creativity has focused on the extent to which time pressures limit the creativity of individuals and teams. Such research treats the individual or team as a passive actor upon which time places constraints on creativity. In our theory, however, we view time as something teams can and do actively influence. In particular, we explain how teams can structure and organize the team creative process to more efficiently use the time that is available. In light of the realities faced by contemporary organizations, where upon other constraints time is in short supply, we expect that taking this approach is a more viable solution than trying to avoid, reduce, or eliminate time pressures altogether.

Toward a Theory of Rapid Creativity in Teams: Directions for Future Research

Our aim in writing this paper was twofold. As evidenced by the preceding sections, we sought to develop a model for how team creative processes, development cycles, structure, and standardization processes advance our understanding of how teams can rapidly generate creative outcomes. In addition to this goal, we also sought to provide a conceptual model and framework upon which other scholars could ground their research on team creativity. In particular, there are several avenues of future research that would be particularly insightful and contribute to the development of a more robust theory of rapid creativity in teams. Thus, we conclude our discussion by outlining several important directions for future research.

In the current theory, we propose that team structure and standardization processes interact with team development cycles to shape how fast teams can engage in the team creative process and ultimately produce creative outcomes. These proposed relationships are generally untested and thus warrant empirical examination in their own right. Beyond these relationships, however, are several interesting nuances that future research should consider. For example, we have made the implicit assumption that the "dials" of team structure and standardization, which teams can adjust in the creative process, operate additively and do not interact. It may be the case, however, that team structure and standardization processes can substitute for each other. For example, implementing the appropriate team structure, based on the team development cycle, might offset the need for the standardization of the team creative process. Likewise, it might be the case that standardizing the team creative process could reduce the inefficiencies associated with misalignment between the team structure and development cycle. In fact, it is possible that the combination of certain team structures and standardization protocols may interact in such a way that offsets the positive benefits of either one. Future research exploring these potential trade-offs and interactions between structure and standardization would be particularly noteworthy.

Another nuance worth exploring originates with an assumption we make about the ease of changing team structures and approaches to standardizing the creative process over time. We generally take for granted the idea that teams can freely change their structure or approach to standardization, but there is also some evidence that teams may be less malleable than this assumption suggests. For example, Moon et al. (2004) showed that teams are more effective moving from specialized, functional structures to less differentiated, divisional structures than the other way around. We consider this in our theory in that, for rapid creativity, teams are moving from a functional to divisional structure as the team develops over time. However, it is not clear from existing research how easy it is for teams to move between centralization and decentralization, or highly standardized to less standardized processes and practices. For example, it might be that the structures and standardization present in the early phases of team development will have an "imprinting" effect that influences how the team organizes in later phases of development. In addition, it is unclear what impact informal team structures such as culture, norms, rules, and interpersonal status and power would have on the adaptive capacity (i.e., the ability to shift from one team structure to another) of teams at various stages of development. It may be that these types of informal structures and routines can inhibit (or enhance) a team's capacity for structural malleability, and ultimately impact how fast teams can move through the team creative process. Future research exploring these dynamic transitions would help extend not only our theory of rapid team creativity but would also contribute to a broader understanding of team dynamics.

Next, in the current theory, we do not explicitly model how team compositional factors influence a team's ability to produce creative outcomes in a timely manner. Nonetheless, we do expect that the collection of individual attributes in the team, and finding the optimal mix of these attributes, will be critical for achieving rapid creativity. For example, individual attributes such as personality (Baer & Oldham, 2006; Barry & Stewart, 1997), affect (Isen, Daubman, & Nowicki, 1987; Amabile, Barsade, Mueller, & Staw, 2005), and personal values (Goncalo & Staw, 2006) have been shown to impact the generation of creative outputs. Likewise, team-level research has shown that diversity can both help and hinder the creative capacity and output of teams (Pearsall et al., 2008). We propose that this stream of research needs to extend its conceptualization of creativity as an outcome and consider not only the number of creative ideas or the degree of creativity but also the speed with which teams generate these ideas. We expect that taking speed into account will expose different sets of relationships and a more refined understanding of how team compositional factors influence the creative capacity of teams.

As mentioned earlier, we assume in our theory building that the timing of the creative process is independent of the time it takes to progress through the team development cycle. In this sense, teams may move through the team creative process within a single phase of team development, or teams may progress to later phases of team development before completing the creative process cycle. We developed our model to explicate how teams at different phases of team development should organize the creative process such that creative ideas are generated in a rapid manner. However, it is quite possible that teams may progress to subsequent stages of the development cycle while in the midst of a creative project. The likelihood for progression to the next development phase may depend on the nature of the team project or task; for example, whether the duration of the project is short-term or long-term, or whether the creative task requires a low or high degree of interdependence. In addition, the overall pacing of the team creative process may have an impact on the pacing of the team development cycle, and vice versa. Future research should explore these temporal dynamics.

Similarly, the assumption that our model of rapid creativity in teams is applicable to all types of team tasks also warrants further investigation. It may be that certain types of tasks would invoke or constrain the types of team structures and standardization protocols that teams can employ. Drawing from Steiner's (1972) typology of task interdependence, scholars have begun to explore the role of the task in group creative processes and performance (e.g., Pirola-Merlo & Mann, 2004). The level and type of interdependence in the team task – whether additive, disjunctive, or conjunctive – may have bearing on which team structures and standardization processes will enable teams to most effectively and efficiently generate creative outcomes. For example, if the task is additive, where the group outcome is a function of the sum of the individual members' products, the team creative process may be best organized through systems that promote accountability and interdependence (e.g., centralized and specialized team structure, high levels of standardization). On the other hand, if the task is disjunctive, where the group outcome is ultimately determined by the performance of the best member, then the team creative process may be best organized to provide the most effective members optimal environments to facilitate individual creativity (e.g., decentralized and generalist structure, low levels of standardization). The task type may also influence whether teams structure the creative process according to earlier or later phases of team development. For example, if members of a newly formed team have expertise in a particular task, they may be likely to advance more quickly to subsequent stages of the team life cycle. The nature of the team task is likely an important element of team creativity that we do not explicitly model in the present theory and thus should be considered further in future research.

As stated earlier, our theory of rapid creativity in teams focuses on the speed with which teams *generate* creative ideas, rather than on the speed with which teams *implement* these creative ideas. This distinction mirrors a related distinction in the literature between the constructs of creativity and innovation, where creativity is considered to be only the first stage of a broader innovation process (West & Farr, 1990). Some scholars have proposed that the factors that encourage creativity or idea generation in teams (e.g., flexible time) may actually inhibit the implementation of creative ideas (West, 2002). Although the question of innovation implementation is beyond the scope of the present theory, we encourage scholars interested in innovation to extend our ideas by considering the impact of our structural and standardization mechanisms on the ability of teams to implement creative solutions in a timely manner.

Finally, we encourage future researchers interested in team creativity to augment the high-quality laboratory research that has and will continue to be done in this area with more field research. This call for more field research is not rooted in a need for evidence of external validity, but rather from a substantive theoretical concern regarding internal validity. In our theory of rapid creativity in teams, we put forth several ideas about how the team creative process might differ or require unique structures and processes depending on the team life cycle phase. The majority of laboratory research samples newly formed, ad hoc teams that are most likely in the team formation stage of development. This reliance on ad hoc teams to provide insight about the team creative process introduces two important limitations. First, although laboratory research demonstrates that newly formed teams can achieve some level of creativity, a traditional laboratory approach to studying team creativity would preclude a comprehensive test of our theory unless the researchers were able to sample teams across the full team development cycle, or follow teams through the entire developmental cycle. For example, newly formed teams may reach a particular level of creativity using more time (or other resources) relative to teams in later developmental stages. Moreover, different team structures and forms of process standardization are likely to differentially impact teams' creative performance across these developmental stages. A second and potentially more important limitation of the emphasis on laboratory research with ad hoc teams is that our current understanding of team creativity may actually be biased toward teams in the formation stage. If the team creative process does in fact differ across the team development cycle as proposed in the present theory, we likely have a very incomplete understanding of team creativity in organizations. Thus, we encourage future researchers to use a variety of research designs and settings, including but not limited to laboratory research, to test our theory and extend the field's understanding of team creativity.

CONCLUSION

Dualities such as speed versus accuracy (Hollenbeck et al., 2002), quality versus quantity (Guzzo & Dickson, 1996), and learning versus performance execution (Druskat, 2000) abound in literature on team dynamics and performance. We propose that creativity versus efficiency is one such duality in teams that can be navigated by organizing the team creative process to align team structures and standardization processes with the team development cycle. Organizations increasingly rely on teams to address creativity and innovation challenges (Kurtzberg, 2005), and we hope this theory offers the foundation for future research on how teams can more rapidly achieve creative outcomes.

REFERENCES

Amabile, T. M. (Ed.) (1988). *A model of creativity and innovation in organisations* (Vol. 10). Greenwich, CT: JAI Press.

Amabile, T. M. (1996). *Creativity in context: Update to 'the social psychology of creativity'.* Boulder, CO: Westview Press.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*(3), 367–403.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*(5), 1154–1184.

Amabile, T. M., & Gryskiewicz, S. S. (1987). *Creativity in the R&D laboratory*. Greensboro, NC: Center for Creative Leadership.

Ancona, D. G., & Caldwell, D. F. (1992). Bridging the boundary: External activity and performance in organizational teams. *Administrative Science Quarterly*, *37*(4), 634–665.

Andrews, J., & Smith, D. C. (1996). In search of the marketing imagination: Factors affecting the creativity of marketing programs for mature products. *Journal of Marketing Research*, *33*(2), 174–187.

Baer, M., & Oldham, G. R. (2006). The curvilinear relation between experienced creative time pressure and creativity: Moderating effects of openness to experience and support for creativity. *Journal of Applied Psychology*, *91*(4), 963–970.

Barry, B., & Stewart, G. L. (1997). Composition, process, and performance in self-managed groups: The role of personality. *Journal of Applied Psychology*, *82*(1), 62–78.

Burns, T., & Stalker, G. M. (1961). *The management of innovation.* London: Tavistock.

Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic Management Journal*, *26*(3), 555–575.

Christensen, C. M. (1997). *The innovator's dilemma: When new technologies cause great firms to fail*. Boston, MA: Harvard Business School Press.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*, 1191–1201.

Drazin, R., Glynn, M. A., & Kazanjian, R. K. (1999). Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review*, *24*(2), 286–307.

Drazin, R., & Van de Ven, A. H. (1985). An examination of alternative forms of fit in contingency theory. *Administrative Science Quarterly*, *30*(4), 514–539.

Druskat, U. (2000). Learning versus performance in short-term project teams. *Small Group Research*, *31*(3), 328.

Ellis, A. P. J., Hollenbeck, J. R., Ilgen, D. R., & Humphrey, S.E. (2003). The asymmetric nature of structural changes in command and control teams: The impact of centralizing and decentralizing on group outcomes. Paper presented at the 8th Annual International Command and Control Research Technology Symposium, Washington, DC.

Elsbach, K. D., & Hargadon, A. B. (2006). Enhancing creativity through 'mindless' work: A framework for workday design. *Organization Science*, *17*(4), 470–483.

Ericksen, J., & Dyer, L. (2004). Right from the start: Exploring the effects of early team events on subsequent project team development and performance. *Administrative Science Quarterly*, *49*, 438–471.

Faucheux, C., & Mackenzie, K. D. (1966). Task dependency of organizational centrality: Its behavioral consequences. *Journal of Experimental Social Psychology*, *2*(4), 361–375.

Feldman, J. M. (1981). Beyond attribution theory: Cognitive processes in performance appraisal. *Journal of Applied Psychology*, *66*(2), 127–148.

Feldman, M. S., & Pentland, B. T. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, *48*(1), 94–118.

Gilson, L. L., Mathieu, J. E., Shalley, C. E., & Ruddy, T. M. (2005). Creativity and standardization: Complementary or conflicting drivers of team effectiveness? *Academy of Management Journal*, *48*, 521–531.

Gilson, L. L., & Shalley, C. E. (2004). A little creativity goes a long way: An examination of teams' engagement in creative processes. *Journal of Management*, *30*(4), 453–470.

Goncalo, J. A., & Staw, B. M. (2006). Individualism–collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*(1), 96–109.

Guzzo, R. A., & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*, *47*, 307–338.

Hargadon, A. B., & Bechky, B. A. (2006). When collections of creatives become creative collectives: A field study of problem solving at work. *Organization Science*, *17*(4), 484–500.

Hollenbeck, J. R., Moon, H., Ellis, A. P. J., West, B. J., Ilgen, D. R., Sheppard, L., Porter, C. O. L. H., & Wagner, J. A., III. (2002). Structural contingency theory and individual differences: Examination of external and internal person–team fit. *Journal of Applied Psychology*, *87*(3), 599–606.

Ilgen, D. R. (1999). Teams in organizations: Some implications. *American Psychologist*, *54*, 129–139.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, *52*(6), 1122–1131.

Kanter, R. M. (1988). When a thousand flowers bloom: Social, structural and collective conditions for innovation in organizations. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 10). Greenwich, CT: JAI.

Katz, R. (1980). Time and work: Toward an integrative perspective. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior* (Vol. 2, pp. 81–127). Greenwich, CT: JAI Press.

Kelly, C., & Rhodes, R. (2007). *The Manhattan project: The birth of the atomic bomb in the words of its creators, eyewitnesses and historians*. New York, NY: Black Dog & Leventhal Publishers, Inc.

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of Management Journal*, *47*(2), 175–192.

Kozlowski, S. W. J., & Bell, B. S. (Eds). (2003). *Work groups and teams in organizations* (Vol. 12). Hoboken, NJ: Wiley.

Kozlowski, S. W. J., Gully, S. M., Nason, E. R., & Smith, E. M. (Eds). (1999). *Developing adaptive teams: A theory of compilation and performance across levels and time*. San Francisco, CA: Jossey-Bass.

Kurtzberg, T. R. (2005). Feeling creative, being creative: An empirical study of diversity and creativity in teams. *Creativity Research Journal*, *17*(1), 51–65.

Kurtzberg, T. R., & Amabile, T. M. (2000). From Guilford to creative synergy: Opening the black box of team-level creativity. *Creativity Research Journal*, *13*(3), 285–294.

Kurtzberg, T. R. & Amabile, T. M. (2001). From Guilford to creative synergy: Opening the black box of team-level creativity. *Creativity Research Journal*, *13*, 285–294.

Leenders, R. T. A. J., van Engelen, J. M. L., & Kratzer, J. (2003). Virtuality, communication, and new product team creativity: A social network perspective. *Journal of Engineering and Technology Management*, *20*(1–2), 69–92.

Lipnack, J., & Stamps, J. (2000). *Virtual teams: People working across boundaries with technology*. New York, NY: Wiley.

Louis, M. R. (1980). Surprise and sense-making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Science Quarterly*, *25*, 226–251.

Manz, C. C., & Sims, H. P. (1987). Leading workers to lead themselves: The external leadership of self-managing work teams. *Administrative Science Quarterly*, *32*(1), 106–129.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, *2*(1), 71–87.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review*, *26*, 356–376.

Maznevski, M. L., & Chudoba, K. M. (2000). Bridging space over time: Global virtual team dynamics and effectiveness. *Organization Science*, *11*(5), 473–492.

Moon, H., Hollenbeck, J. R., Humphrey, S. E., Ilgen, D. R., West, B., Ellis, A. P. J., & Porter, C. O. L. H. (2004). Asymmetric adaptability: Dynamic team structures as one-way streets. *Academy of Management Journal*, *47*(5), 681–695.

Morgeson, F. P. (2005). The external leadership of self-managing teams: Intervening in the context of novel and disruptive events. *Journal of Applied Psychology*, *90*, 497–508.

Morgeson, F. P., & DeRue, D. S. (2006). Event criticality, urgency, and duration: Understanding how events disrupt teams and influence team leader intervention. *Leadership Quarterly*, *17*(3), 271–287.

Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology*, *12*(1), 3–23.

Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review*, *69*(November–December), 96–104.

Nystrom, H. (1990). Organizational innovation. In: M. A. West & J. L. Farr (Eds), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 143–161). Chichester: Wiley.

Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, *39*(3), 607–634.

Pearsall, M. J., Ellis, A. P. J., & Evans, J. M. (2008). Unlocking the effects of gender faultlines on team creativity: Is activation the key? *Journal of Applied Psychology*, *93*(1), 225–234.

Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: An analysis of work group diversity, conflict, and performance. *Administrative Science Quarterly*, *44*(1), 1–28.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: Aggregating across people and time. *Journal of Organizational Behavior*, *25*(2), 235–257.

Pugh, D. S., Hickson, D. J., Hinings, C. R., & Turner, C. (1968). Dimensions of organizational structure. *Administrative Science Quarterly*, *1*, 65–105.

Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *Leadership Quarterly*, *15*(1), 33–53.

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, *30*(6), 933–958.

Shank, J. K., Niblock, E. G., & Sandalls, W. T. (1973). Balance "creativity" and "practicality" in formal planning. *Harvard Business Review*, *51*(1), 87–95.
Shaw, M. E. (1981). *Group dynamics: The psychology of small group behavior* (3rd ed.). New York: McGraw-Hill.
Steiner, I. D. (1972). *Group processes and productivity*. San Diego, CA: Academic Press.
Sutton, R. I., & Hargadon, A. (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, *41*(4), 685–718.
Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, *45*, 315–330.
Taylor, F. W. (1911). *The principles of scientific management*. New York: Harper & Brothers.
Torrance, E. P. (1988). The nature of creativity as manifest in its testing. In: R. J. Sternberg (Ed.), *The nature of creativity: Contemporary psychological perspectives* (pp. 43–75). New York, NY: Cambridge University Press.
Triandis, H. C., Bass, A. R., Ewen, R. B., & Mikesell, E. H. (1963). Team creativity as a function of the creativity of the members. *Journal of Applied Psychology*, *47*(2), 104–110.
Turner, M. E. (1992). Group effectiveness under threat: The impact of structural centralization and performance set. *Journal of Social Behavior and Personality*, *7*, 511–528.
Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Sciences*, *32*(5), 590–607.
van Knippenberg, D., De Dreu, C. K. W., & Homan, A. C. (2004). Work group diversity and group performance: An integrative model and research agenda. *Journal of Applied Psychology*, *89*(6), 1008–1022.
Vogus, T. J., & Welbourne, T. M. (2003). Structuring for high reliability: HR practices and mindful processes in reliability-seeking organizations. *Journal of Organizational Behavior*, *24*(7), 877–903.
Wagner, J. A. (Ed.) (2000). *Organizations* (Vol. 6). New York; Washington, DC: Oxford University Press; American Psychological Association.
West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, *51*(3), 355–424.
West, M. A., & Farr, J. L. (1990). Innovation at work. In: M. A. West & J. L. Farr (Eds), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 3–13). Chichester: Wiley.
Zhou, J. (2003). When the presence of creative coworkers is related to creativity: Role of supervisor close monitoring, developmental feedback, and creative personality. *Journal of Applied Psychology*, *88*(3), 413–422.
Zhou, J., & Shalley, C. E. (2003). Research on employee creativity: A critical review and directions for future research. In: J. J. Martocchio & G. R. Ferris (Eds), *Research in personnel and human resources management* (Vol. 22, pp. 165–217). Oxford, England: Elsevier Science Ltd.

THINKING INSIDE THE BOX: HOW CONFORMITY PROMOTES CREATIVITY AND INNOVATION

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ABSTRACT

Intuition, along with empirical research, suggests that the generation of creative ideas benefits from divergent thinking among team members. However, the generation of creative ideas represents only one stage of the innovative process; teams also must implement ideas. In this chapter, we propose that effective idea implementation may depend on the opposite of team divergence: team conformity. Specifically, we propose that conformity facilitates various group processes important for effective idea implementation, including team coordination, information exchange, conflict management, and collective efficacy. Next, we discuss the role of leaders in managing the magnitude and processes of conformity. The chapter concludes with a discussion of implications and important next steps for studying conformity in relation to team innovative effectiveness.

Creativity and innovation are becoming increasingly important for organizational effectiveness (Woodman, Sawyer, & Griffin, 1993). In a dynamic

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economy, organizational survival depends on adapting to changing consumer preferences, increased competition, and new technologies (Scott & Bruce, 1994; West & Farr, 1990). Creativity and innovation represent crucial means by which organizations can respond to change and can proactively shape their business environments. As Amabile (1988) noted, "… it is impossible to escape the reality that corporations must be innovative to survive" (p. 123).

To achieve this innovation, organizations increasingly rely on work groups or teams (e.g., Anderson & West, 1998; Sethi, Smith, & Park, 2001). A commonly cited rationale for this increased use of teams for innovation is that teams enhance creative potential by unifying individuals with diverse backgrounds and perspectives toward a shared creative purpose (e.g., Bantel & Jackson, 1989). Unlike routine and algorithmic tasks (i.e., tasks with a single "correct" solution), developing creative ideas often means addressing ambiguous problems that lack a single "correct" answer; instead, creativity necessitates the divergent perspectives and cross-fertilization of ideas that teams are expected to provide.

However, creative idea generation represents only one (often small) aspect of the creative process (Farr, Sin, Tesluk, & Shavinina, 2003). Successful team innovation hinges not only upon producing creative ideas, but also upon eventual implementation of those ideas (Anderson & West, 1998; Farr et al., 2003; West, 2002). While good ideas are not uncommon in organizations, most good ideas are either never implemented or are implemented unsuccessfully (Hackman & Wageman, 1995; Klein & Ralls, 1995). It is in this latter stage of the innovative process – that of *idea implementation*, where creative initiatives usually falter (Bushe, 1988; Pfeffer, 1994).

Such failure results from the difficulties inherent in shepherding an idea from origination to eventual realization. In implementing the idea, one must address and overcome various obstacles such as adapting to unforeseen barriers, combating organizational inertia, and challenging the status quo (Klein & Sorra, 1996). Given that idea *implementation* entails rather discrepant processes from idea *generation*, the factors related to team effectiveness in these various creative stages also are likely to differ. In fact, whereas divergent thinking might foster creative "sparks" during idea generation, the team's ability to implement these ideas may necessitate the opposite: conformity.

In this chapter, we highlight the role of conformity in team innovation. We conceptualize conformity as, "modifying one's behavior to match the behavior of others" (Cialdini & Goldstein, 2004). Although such modification may exacerbate problems during idea generation and evaluation phases of creativity, we argue that team member conformity can facilitate the effective implementation of creative ideas. Thus, the purpose of this chapter is to explain the critical role of conformity during the creative process.

In discussing conformity's role in team innovation, we adopt Farr et al.'s (2003) framework, which conceptualizes innovation in four stages: problem identification, idea generation, idea evaluation, and idea implementation, but primarily focus on the potentially positive effects of conformity during the implementation phase. Specifically, we first discuss how conformity can facilitate the group processes predictive of successful performance during idea implementation. After that, we address the role of leadership in fostering the "conformity dynamics" necessary for effective team innovation. The chapter concludes with a discussion of implications and future research directions.

CONFORMITY

Seminal studies from social psychology have documented the emergence of (often destructive) behavioral changes in response to the behaviors of others (see Nemeth, Goncalo, Brock, & Green, 2005 for a review). For example, Asch's (1955) laboratory studies demonstrated that participants expressed persistent and grossly inaccurate judgments in response to others' judgments. Milgram's (1963) classic work demonstrated behavioral conformity in response to an authority figure (i.e., obedience). In addition, Hood and Sherif (1962) showed that conformity can persist over time and outside the presence of others. Extending the notion of conformity to the context of group decision-making tasks, Janis (1972) argued that faulty decision-making can emerge in high-pressure situations when groups reach consensus prematurely. Here, we draw from these classic works to theorize about the conditions under which conformity can have both negative and positive effects on team creativity and innovation.

Various conceptualizations of conformity have been offered, including: modifying one's thinking to that of the majority (Nemeth, 1986), adhering to a group norm (Goncalo & Duguid, unpublished manuscript), altering one's beliefs or behaviors in response to perceived group pressure (Kiesler, Zanna, & Desalvo, 1966), and the act of changing one's behavior to match the responses of others (Cialdini & Goldstein, 2004). In this chapter, we adopt the last of these conceptualizations, as it represents the classic social psychological treatment of conformity.

This definition, however, is somewhat vague and imprecise for the present purposes. A more nuanced definition which better illustrates our treatment of conformity is "the act of team members changing their behaviors to promote and express team unity." Several points regarding this latter definition, and the way in which our treatment of conformity differs from others in the organizational literature warrant mention. These points and distinctions are perhaps best illustrated through an example.

Consider a situation in which a board of directors is generating a list of candidates from which they will select the organization's new chief executive officer. In this scenario, norms which promote divergent and individualistic thinking and the free expression of ideas are generally beneficial for generating quality solutions. Conversely, norms which foster a psychologically unsafe environment where ideas are not to be expressed or acted upon unless they converge with those of other team members' is detrimental to idea generation (e.g., Edmondson, 1999; Nemeth, Staw, & Berkowitz, 1989). Thus, the team may function best here as team members conform to norms of open expression and sometimes even outward dissent (e.g., Nemeth, Personnaz, Personnaz, & Goncalo, 2004; Postmes, Spears, & Cihangir, 2001).

However, as we elaborate in the following pages, adhering to such norms could be disastrous when the team goes to implement their idea. Continuing with this example, we submit that the board must act in a unified manner when implementing the steps to ensure that other stakeholders approve of their final selection. Thus, for instance, Board members must appear unified when presenting their final selection to shareholders or the media, even if certain members disagree with this final decision. Similarly, board members must share information with each other about the concerns that they hear from these stakeholders' so that the board can respond to such concerns in a coordinated manner.

This example illustrates several points regarding our treatment of conformity. First, we do not regard conformity as the act of adhering to any or all group or organizational norms. While the board needs to adhere to norms both before and after making their decision, the nature of those norms clearly differs. Our focus here is on conforming to norms that promote and express team unity. Thus, instead of team members being encouraged to offer ideas without fear of embarrassment or recrimination, as is generally desirable during the initial generation of ideas (e.g., of candidates here, Nemeth & Wachtler, 1983), we are interested in cases where team members should not outwardly express such ideas (e.g., when the board discusses its selection with the media); instead they should actively inhibit expressing such concerns, especially to those outside the team.

A second point that bears mention is that conformity here refers to the modification of actions and behaviors, not necessarily cognitions. Although the board members may disagree with each other about their final selection, the group's outcome is dependent on these members modifying their behavior in accordance with the group's wishes. In fact, inherent in our treatment is the notion that conforming can entail *willfully modifying one's own actions or behaviors, despite strong internal pressures against such modification*. Put simply, group members conform, despite being motivated not to do so in some cases. This phenomenon stands in contrast to the social influence processes where individuals' private cognitions and judgments, not only their outward appearance, change (see Nail, MacDonald, & Levy, 2000).

This willful modification of behaviors also distinguishes our treatment of conformity from the type of conformity that may be required during the initial generation of ideas. Adhering to the norm of open expression of ideas in this earlier stage may be uncomfortable for some (Camacho & Paulus, 1995). However, we would imagine that the phenomenology of this type of discomfort is quite discrepant from that of having to advocate for or work toward a plan or idea that one finds incorrect or ill-advised. Indeed, several studies show that group members do not like to change their preferences once formed (e.g., Brodbeck, Kerschreiter, Mojzisch, Frey, & Schulz-Hardt, 2002; Greitemeyer & Schulz-Hardt, 2003); acting contrary to those preferences would seem especially challenging.

Third, as is apparent in the discussion that follows, conformity can manifest in various forms or actions. The common theme among them is that these actions are intended to promote or express ''team unity.'' Thus, exerting maximum effort, completing tasks in a timely manner, or publicly advocating for the group's idea all could represent conformity. A particular type of conformity in which we are interested and that we discuss throughout is conformity with respect to the public expression of preferences and opinions. Specifically, we emphasize the importance of group members overtly advocating and arguing for the group idea, even though they may disagree with it (see Stasser, Kerr, & Davis, 1989 for a similar conceptualization). This public expression as well as other conforming behaviors (e.g., completing tasks in a timely manner) are manifestations of team unity in its aim to implement the idea, despite, not because of, some members' reservations about that idea.

On a related point, our definition also underscores the need to consider the motivation in tandem with the behavior. As an illustration, imagine that a board member who initially disagreed with the group's decision later chooses to make individual efforts to prepare the candidate for meetings with the shareholders. This individual appears to be conforming to the team's wishes. However, if he or she is doing so to ''outdo'' other team members or to identify further weaknesses in the candidate, his/her behavior would not constitute the nature of conforming under consideration here. The outward behavior may be appropriate, but the motivation is not one of team unity. In the following sections, we elaborate on the benefits from such conformity and on the challenges that a lack of it can create.

CREATIVITY IN TEAMS

Organizations' increasing reliance upon work groups (e.g., Ilgen, 1999) also has manifested in their utilizing groups for creative endeavors (Farr et al., 2003; Sethi et al., 2001; West, 2002; West & Anderson, 1996). For instance, teams may be assembled to work on a specific creative project (e.g., development of a new product) or can represent standing units who regularly deal with tasks requiring creativity (e.g., top management teams).

Despite the recognition that teams now shoulder much of the creative load, organizational scholars only recently have begun addressing in earnest the factors and processes that determine group innovation effectiveness (see Anderson & West, 1998; Caldwell & O'Reilly, 2003 for similar observations). Historically, work on creativity and innovation has focused on the role of individual, organizational, and contextual factors in facilitating or inhibiting the innovative process (for reviews, see Amabile, 1988; Baldridge & Burnham, 1975; Runco, 2004; Zhou & Shalley, 2003). For instance, research has established that facilitators of individual creativity and overall innovation include efficacy, empowerment, autonomy, leader–member exchange (i.e., the quality of the manager–employee relationship) and openness to experience (Harrison, Neff, Schwall, & Zhao, 2006).

The relative scarcity of scholarly attention devoted to team innovation is significant given that decades of research confirm that individual attributes and processes are not isomorphic with those at the team level (e.g., Hill, 1982; Steiner, 1972). We suspect that the process of group innovation almost certainly differs in various important ways from the individual-level process; so too, we imagine, do the factors predictive of innovation effectiveness at the different levels.

Of the research that has been done on team innovation, the vast majority has focused either on the generation of ideas (often treated as synonymous with creativity) or on innovation in general, such as the quality of the end product (e.g., Drach-Zahavy & Somech, 2001; Pearsall, Ellis, & Evans, 2008) – a trend also evident in the creativity literature in general (Harrison et al., 2006). Research has documented, for instance, that group-level creativity and overall innovation are related to diversity and functional heterogeneity (Bantel & Jackson, 1989) as well as psychological safety (Edmondson, Bohmer, & Pisano, 2001). Groups that exhibit higher levels of creative and innovative performance also tend to cooperate and coordinate more effectively (Tjosvold, 1998).

However, as noted above, creativity (i.e., idea generation) represents only the first phase of the innovative process. Acknowledging this fact, Farr and colleagues' (2003) recently developed a dynamic model of workgroup innovation. This model, like past models (Amabile, 1988; Kanter, 1988; West, 2002), conceptualizes the innovative process as entailing a series of temporally ordered stages. Specifically, Farr et al. conceptualize innovation as occurring in four stages: problem identification, idea generation, idea evaluation, and idea implementation.

Effects of Conformity on Initial Stages of Workgroup Innovation

While a fair amount of work is beginning to accumulate regarding team innovation with respect to the first three of these stages (Perry-Smith & Shalley, 2003) and especially the second two (e.g., Paulus & Yang, 2000), much less is known about the factors related to effective idea implementation (but see Drach-Zahavy, Somech, Granot, & Spitzer, 2004 for a rare exception). This relative neglect of the final stage is consequential because implementation fundamentally differs from idea generation and evaluation, and so too therefore, do the antecedents of each stage (Farr et al., 2003; Janssen, van de Vliert, & West, 2004). In fact, variables that promote effectiveness in one stage may actually hinder performance in the other stage. This last possibility is the one we address here by examining conformity in the implementation stage. In particular, we propose that whereas conformity relates negatively to performance during idea generation and evaluation, it should yield superior performance during implementation.

The first part of this proposition is well established. A wealth of data demonstrates the benefits of group members being able to express divergent viewpoints during decision-making tasks (e.g., Bartis, Szymanski, & Harkins, 1988; Diehl & Stroebe, 1987; Janis, 1972; Nemeth et al., 1989). Similarly, teams generate more and higher quality ideas when members act in an individualistic, rather than collective manner (e.g., Goncalo & Staw, 2006). Also consistent with this idea are studies demonstrating the benefits of emphasizing the quantity of ideas expressed (e.g., Christensen, Guilford, & Wilson, 1957).

According to all of these findings, conformity, in the sense we are conceptualizing it here, should negatively predict team effectiveness in terms of idea generation and evaluation. In many cases, creativity derives from abandoning or deviating from normative criteria, not adhering to it (e.g., Amabile, 1996). According to this idea, teams whose members are encouraged only to behave in a more collectivistic and unified fashion and to only express sentiments convergent with those shared by other team members or those endorsed by the team leader would lead to fewer, and therefore ultimately poorer solutions. In a recent study supporting this notion, Chirumbolo and colleagues, across three separate studies, found that the need for closure (operationalized as time pressure in one study) increased conformity and, in turn, yielded lower group creativity (Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004).

An important point of clarification here is that the above argument does not suggest that creativity necessarily follows from a lack of strong norms or from groups operating in an ill-structured problem-solving space. In fact, several recent studies evince the benefits of group structure and norms for idea generation (see Flynn, Chatman, & Spataro, 2001; Nijstad & Stroebe, 2006). For instance, Goncalo and Duguid (unpublished manuscript) found that groups who adhered to strong individualistic norms outperformed groups who operated with strong collectivistic norms or with weak (individualistic or collectivistic) norms. Individual-level studies also support the benefits of structure. For instance, Ohly, Sonnentag, and Pluntke (2006), found that workers with more routinized jobs were both more creative and innovative than those with less routine in their work. In addition, Rietzschel, De Dreu, and Nijstad (2007) showed that individual-level need for structure positively predicted performance for those people who were less concerned with making decisions and potentially being incorrect, but not for those were more anxious about their decisions.

Taken together, these studies imply that having structure and norms in place when the group generates ideas can often be beneficial, not necessarily detrimental (De Jong & Kemp, 2003; Nemeth et al., 1989). However, unlike the present treatment of conformity, these studies emphasize conformity with respect to uniformity in the nature of behavior (e.g., everyone should act in an individualistic manner or everyone should speak in turn). The objective of such norm creation is not to promote uniformity, but instead to foster an environment where employees generate and are able to express divergent views that may deviate from the normative of shared criteria (Amabile, 1996; Eisemann, 1990). Conversely, here we are referring specifically to conformity in the expression of behaviors (not just the nature of behavior); the objective of this type of conformity is unity, not divergence or independence, in behavioral expression. Based on the above reasoning, we offer the following proposition:

> **Proposition 1.** The extent to which team norms permit the expression of divergent and unshared views will be associated with more and higher quality ideas during idea generation and evaluation.

After generating these ideas, however, norms that promote conformity, in the way we are conceptualizing it here, should be beneficial as the team then implements its idea. As noted above, much less is known about conformity and implementation (Klein & Sorra, 1996). Thus, in an attempt to redress this void, we outline below a theoretical model discussing the proposed role of conformity in idea implementation. This model, which appears in Fig. 1, represents what Ilgen and colleagues recently termed an ''input–mediator–output–input'' (IMPO) model (Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Such models represent an extension of basic input–process–outcome models by explicitly integrating one or more feedback loops.

As seen in Fig. 1, we posit that most of the relationships in the model are bidirectional in nature. For instance, just as conformity impacts group processes, the effectiveness of these processes also likely impacts conformity. Related to this point, the creative process is not always as linear as depicted in Fig. 1; instead creativity can evolve in a nonlinear (Anderson, De Dreu, & Nijstad, 2004), and/or iterative and cyclical manner (Drazin, Glynn, & Kazanjian, 1999). However, for the purposes of clarity, we move from left to right in describing this model. We return to this issue nonlinearity when

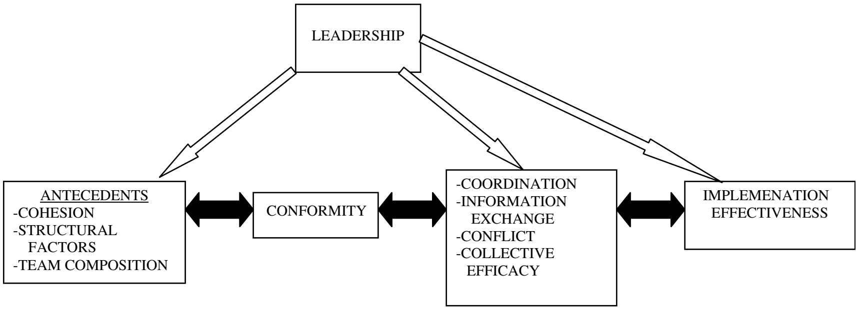

Fig. 1. Theoretical Model of the Antecedents and Consequences of Team Conformity during the Idea Implementation Stage of Team Innovation.

discussing the issue of teams returning to earlier stages of the creative process, and on the role of conformity in this switching.

CONFORMITY AND TEAM PROCESSES

A first point that bears mention regarding the following discussion concerns the present conceptualization of conformity in relation to group processes. While Fig. 1 depicts conformity as temporally preceding these processes, a more accurate characterization, we believe, is that of conformity as manifesting in or "playing out" through these processes. For instance, a group member who refuses to cooperate is not conforming; nonconformity here is the individual behavior which then impacts these team processes and emergent states (Marks, Mathieu, & Zaccaro, 2001). A second point about this figure is that we do not explicitly discuss the antecedents to conformity that are depicted in the first box, as several reviews of such antecedents already exist (Allen, 1965; Cialdini & Goldstein, 2004; Stasser et al., 1989). Related to this, we do not posit that these antecedent variables impact team processing only through conformity. Certainly, several of these factors (e.g., cohesion, team composition) influence resultant team processes through various means, of which conformity only represents one particular mechanism.

While conformity (or nonconformity) likely manifests in a multitude of group processes and emergent states, we focus here on four: coordination, information exchange, conflict, and collective efficacy. Each of these four is important for team effectiveness (Kozlowski & Ilgen, 2006) and team innovation (van Offenbeek & Koopman, 1996) and is posited to also relate to team members' willingness to conform. In addition, these processes and states are broad and encompass various other, more specific aspects of team functioning.

Coordination

Turning first to coordination, considerable research demonstrates the benefits of high team coordination for team effectiveness, especially in environments requiring adaptive responses (e.g., Kozlowski, Gully, Nason, & Smith, 1999). According to Guastello and Guastello (1998) "coordination occurs when two or more people do the same or complementary tasks at the same time" (p. 423).

We suggest that coordination may be especially consequential given the nature of innovative performance. As stated by Caldwell and O'Reilly

(2003), by "its very nature, innovation is largely unpredictable and requires flexibility, opportunism, and adaptability." When implementing ideas, conditions change, obstacles emerge, and the idea itself often is transformed (West & Farr, 1990). Consider just a sampling of the obstacles that require team coordination when trying to implement a creative idea.

First, the team may incur resistance from several organizational stakeholders who prefer not to implement the innovation, but instead wish to maintain the status quo (Drach-Zahavy et al., 2004; Janssen, 2003). This resistance can come both from members of the organization, such as other workers or management (Pfeffer & Sutton, 2000), and also from external constituents such as clients or other organizations involved. For instance, a new intranet system designed to promote information accessibility may threaten those who previously had privileged access to that information (e.g., Klein, Conn, & Sorra, 2001). Because their former role of informational "gatekeepers" will be threatened by this system, such individuals may resist its implementation over a perceived fear of job or status loss.

Even when this "buy-in" has been obtained, the practicalities of innovation can still be challenging for organizational members. At a minimum, innovation disrupts established ways of doing things and replaces them with something new (West & Farr, 1990). As Ford and Sullivan (2004) note, "creativity is an inherently destructive process … these [creative] proposals disrupt, or perhaps destroy, established routines and domains of practice" (p. 280). Thus, effectively instituting a new policy or computer program necessitates the team shifting its attention from idea generation and evaluation to combating the organizational turbulence and resistance that innovation may foster. For instance, teams need to make certain that others (e.g., organizational members) comprehend the rationale for the change (e.g., Schweiger & Denisi, 1991) and understand its ramifications and practical implications.

Yet another set of obstacles for idea implementation is the logistical and political realities that teams may have failed to anticipate during idea generation. As new information comes to light and circumstances change, the team will need to devise ways to adapt such as revisiting the idea and/or its implementation (e.g., Tesluk & Mathieu, 1999). A particular obstacle unique to creativity is the possibility that a competing organization has already implemented the idea that the team generated. When such news emerges, the team will need to reconsider its actions and develop a rapid and coordinated response to quickly implement their own idea (Brown & Eisenhardt, 1997; Tesluk & Mathieu, 1999; Waller, 1999). For example, the team might need to quickly shift its focus to differentiating their product from those of competitors, highlighting the price advantages, or by publicizing unique product features.

In addressing all of these various obstacles, members of the team must behave in a unified and coordinated manner. In particular, instead of focusing on novel creative ideas, the team must shift its attention toward tacking the practical considerations that implementation provokes (Ford & Sullivan, 2004). Doing so requires the team to coordinate by adopting a less diverse, and instead more structured and integrated focus. This idea is consistent with Gersick's (1988) research on punctuated equilibrium, in which she found that effective teams were able to transition from a phase of loose idea generation to one of structure and role clarity. We suspect a similar process is necessary for creative teams whose members must transition from a norm of divergent thinking to a norm of supporting idea implementation, even if that means suppressing their personal reservations.

Conformity potentially could bolster such coordination through various psychological means. For instance, the desire for social acceptance (Baumeister & Leary, 1995) may foster individuals to act in accord with their group so as to avoid being seen as deviant or troublesome or as a free rider (Diehl & Stroebe, 1987). Thus, despite their worries that the project schedule is too condensed, members still may try to synchronize their behaviors with those of their teammates, for example, for fear of embarrassment or social exclusion. Similarly, such synchronization could result from members' concerns that their poor performance will result in the loss of individual and/or group rewards. Based on this reasoning, we suspect that the degree to which members' contributions are both identifiable and necessary for successful team performance would moderate the conforming behaviors predictive of team coordination. In other words, fear of being identified as the "weak link" and of the resulting social and reward repercussions might increase team member effort directed toward coordination.

However, the opportunities for a lack of coordination during creative projects are plentiful. For instance, an individual who is resentful of not having his idea adopted by the group could sabotage the project by refusing to align his actions with those of the team or by not adhering to the task schedule. If nobody else on the team could compensate for the disgruntled member's expertise or responsibilities, the team would incur a loss of synchrony, and ultimately, poorer performance (e.g., Marks et al., 2001). Similarly, a lack of coordination could result when the innovator who conceived of the original idea engenders envy among team members and therefore loses their support and cooperation (Janssen, 2003). Moreover, individuals who feel that the implementation should be proceeding faster or slower than it is can hinder team effectiveness by performing at a different temporal pace than the rest of the team (e.g., Gurtner, Tschan, Semmer, & Naegele, 2007).

A different type of barrier to such coordination is the heterogeneous composition of many creative teams. Because creativity can result from having diverse perspectives (Bantel & Jackson, 1989), organizations often form teams composed of individuals with dissimilar backgrounds, abilities, and views (e.g., Schneider & Northcraft, 1999). While such teams potentially do result in more and better creative ideas (e.g., Drach-Zahavy & Somech, 2001), their ability to coordinate with each other in implementing ideas could be limited. For instance, because the members of cross-functional teams may work in physically and socially disconnected units, opportunities to coordinate via face-to-face contact may be diminished (Keller, 2001). In addition, the diversity that may have resulted in a superior idea also could hinder team members' to adopt a shared understanding of the implementation process and of the logistical details due to members' unique jargon and norms (e.g., Pelled, 1996). Thus, to the extent that members fail to regularly interact and to develop a shared situational understanding (Cannon-Bowers, Salas, & Converse, 1993), their sense of team identity (Somech, 2006) and their corresponding willingness and ability to conform also may be diminished. In sum, having all group members conform by appropriately coordinating their efforts seems essential for successful implementation. However, various factors can impede team members' willingness to engage in such conformity. The above reasoning implies the following proposition:

Proposition 2. Greater conformity with respect to coordination and synchrony of behavior will be associated with higher levels of team effectiveness during idea implementation.

Information Exchange

Open and effective information exchange among team members represents a second important determinant of workgroup innovation effectiveness (van Offenbeek & Koopman, 1996). Conforming to the practices of obtaining, sharing, and willingly accepting information is likely beneficial in all organizational teams (Edmondson, 1999); however, the necessity of effective information exchange may be especially great for teams implementing ideas. As Drach-Zahavy and Somech (2001) note, "In implementing innovation, information exchange leads to a more complete and accurate specification of the needs of the different parties, to interventions and solutions that suit the characteristics of the organization, and to more realistic expectations" (p. 112). More specifically, the exchanging of information aids teams in detecting organizational problems that need creative solutions (Ancona, 1990), in ensuring that team members possess complete and timely knowledge (Woodman et al., 1993), and in facilitating the identification and handling of emergent obstacles (Klein & Sorra, 1996). In line with these ideas, several studies have documented the importance of communication in team innovation (e.g., Bantel & Jackson, 1989; Drach-Zahavy & Somech, 2001).

One particularly important type of information transfer entails team members transmitting comments or reactions that they receive from other organizational stakeholders (Ancona, 1990) and doing so in a timely manner. Returning to the CEO selection example from above, board members who disagreed with the original idea not only must transmit to their teammates the criticism that they receive about the idea, but also the recognition or praise for the project that others express. In addition, effective information exchange also entails members relaying to one another any challenges or opportunities that they recognize during project implementation (Klein & Ralls, 1995). Thus, members initially opposed to the CEO selection, for example, need to focus upon and articulate to their teammates factors that they see as increasing the likelihood of project success, not only the barriers that arise of which they had earlier foreshadowed.

In addition to information sharing among team members, effective information exchange with those outside the team is also related to innovative performance. For instance, the implementation of cross-functional teams partially is based on the presumed benefits that accrue from having representatives from different units or departments (Keller, 2001). Team members often are expected to act as the representative of their units, transmitting and relaying information between the team and unit (Ancona & Caldwell, 1992). Consistent with this network perspective, Tsai (2001) found that workgroups with central network positions generally produce more innovations than do less centrally located teams. Other points of information transfer can include contacts within the industry, among teams, and with clients and external stakeholders.

Furthermore, group members not only need to transfer relevant information to others, but they also must seek out, accept, and act upon information that others transmit to them, as well as accurately remembering who expressed what information (or who provided them with that information, see e.g., Diehl & Stroebe, 1991). Only by accepting such information will the team member be able to respond in a timely and appropriate manner. As an example, imagine that a board member initially opposed to the group's selection overhears that a rival organization also is interested in hiring this individual as CEO. This recalcitrant member must appropriately determine the veracity of this information and then act upon it (e.g., by alerting other board members). However, to the extent that nobody else on the team has heard this rumor, the member may be incredulous about its truthfulness and therefore hesitant to report it to the group (e.g., Stasser & Titus, 1985). Amplifying this hesitancy might be the board member's fear of the group seeing her as trying to derail the implementation of the group's decision given her initial objections to this candidate.

Effective information exchange also requires willingness on the part of those initially in favor of the idea to seek out, recognize, transmit, and act upon information regarding potential obstacles or barriers to implementation success. Failure to do so will lead the group to adopt an unrealistic view of the challenges that they face in implementing its idea. Here too members may be unwilling to acknowledge the truthfulness of this negative information and relay it to their teammates insofar as the information contradicts the group's desire for and beliefs in the idea's suitability (Kruglanski & Webster, 1996).

As the preceding paragraphs make clear, various situations can lead team members to refrain from providing information in an accurate and timely manner. Similarly, circumstances could preclude individuals from appreciating or making use of the information that others share with them. In particular, we suspect that individuals who remain uncommitted to the group's idea or to the efficacy of the idea may fail to conform to effective information exchange processes. For instance, members who regard the group's idea as silly, whimsical, illogical, or unfeasible might fail to share their knowledge, either due to a lack of interest in the project or to the desire to see the idea fail. Consistent with this idea, Marks (1999) found that high levels of communication partially mediated the positive relationship between collective efficacy and team performance.

In addition to those who are skeptical of the group's idea, members who are angry or resentful of the group also will not likely exchange information in an appropriate manner. For example, individuals' whose ideas were summarily rejected during the generation stage may harbor ill will toward the team and a corresponding desire to see the team fail. Moreover, because the group's eventual success may be attributed primarily to one person – such as the one generating the initial idea – competitive motivations can emerge (Janssen, 2003). A long line of research documents the pernicious consequences of intrateam competition on team information exchange and ultimate team effectiveness (e.g., Bornstein & Ben-Yossef, 1994; Hardin, 1968). In sum, several factors that emerge during the innovative process can hinder the intentional exchanging of information and, in turn, can hamper implementation effectiveness. These factors may be reduced or even altogether eliminated when team members demonstrate conformity. Teams that coalesce behind an idea, despite resentfulness or competitiveness, are likely to be more effective in implementing ideas than are teams that persist in expressing divergent viewpoints or not expressing any information at all.

Proposition 3. Greater conformity with respect to information sharing behaviors will be associated with higher levels of team effectiveness during idea implementation.

Conflict

A third factor through which conformity is posited to influence implementation effectiveness is team conflict. As teams progress through the innovative process, there exists a multitude of opportunities for conflict to arise and derail the project (West, 2002). Perhaps not surprisingly, then, researchers have shown that most teams experience at least some conflict during innovation (Souder, 1987), and that managing such conflict represents one of the most time-consuming tasks for leaders of creative teams (Thomas & Schmidt, 1976).

As with the other processes, researchers primarily have focused on the role of conflict with respect to generating and evaluating ideas (e.g., Jehn & Mannix, 2001). Research generally has converged on the conclusion that *some* conflict can be advantageous during idea generation and evaluation, especially if that conflict is task-relevant and handled appropriately (e.g., Nemeth et al., 2004; Tjosvold, 1991; West, 2002). Conflict during these initial stages can promote deep, divergent, and flexible thinking and help the group evaluate and modify ideas (e.g., De Dreu & Weingart, 2003; James, Chen, & Goldberg, 1992; Nemeth et al., 2004).

While conflict can improve effectiveness during idea generation and development, its emergence during implementation may be less positive. Given the obstacles that manifest during idea implementation (Klein & Knight, 2005), we suspect that teams characterized by consistent conflict and discord will fail in ultimately executing the team's idea. In particular, high levels of conflict likely will result in the group splintering and, in turn, a decreased willingness for members to endure the stress, greater effort, and organizational and political barriers that implementation entails (Klein & Sorra, 1996). This idea is supported by a wealth of findings linking correlates of team conflict, such as lower team satisfaction and cohesion (De Dreu & Weingart, 2003), to poorer team performance (Beal, Cohen, Burke, & McLendon, 2003; Mullen & Copper, 1994). Moreover, the idea that conflict differentially relates to performance across stages converges with longitudinal research indicating that conflict can be beneficial toward the beginning of the group's interaction but can have deleterious effects later in the project's life (Jehn & Mannix, 2001).

At least one recent study, in fact, lends direct support to the differential effects of conflict across the various stages of team innovation. Kratzer and colleagues (2006) investigated the relationship between conflict (which they termed polarity) and innovative performance in 51 creative teams, who were employed by 11 different organizations and were developing a range of different products (e.g., cellular phones, copy machines). Consistent with the ideas above, they found that conflict exhibited an inverse U-shaped relationship with creative performance during the idea generation phase, but an inverse relationship with creative performance during the implementation (i.e., "commercialization") phase (Kratzer et al.).

However, this result does not imply that all team members need to agree with one another in order for the team to achieve lower levels of conflict. In reality, differences in opinion are inevitable; what determines the level of resultant conflict is individuals' willingness to handle those differences in an appropriate manner. Specifically, avoiding conflict entails team members either suppressing their discrepant viewpoints or ensuring that they voice their different perspectives in a respectful and constructive manner (e.g., De Cremer & Van Knippenberg, 2002).

Attempts at either strategy, however, may be especially difficult with respect to creativity, given that individuals experience a sense of ownership and identity with their creative ideas (e.g., De Dreu & van Knippenberg, 2005). Sacrificing one's own ideas and conforming to the group's plan may be difficult when people are certain that their own ideas are superior or correct. However, the decision to conform is essential for the team to proceed in a unified manner in addressing the challenges of implementation.

Proposition 4. Greater conformity with respect to engaging in behaviors to minimize team conflict will be associated with higher levels of team effectiveness during idea implementation.

Collective Efficacy

Collective efficacy, which represents more of an emergent state than a group process (Marks et al., 2001), also is posited to depend largely on team members' willingness to conform. Extending Bandura's original ideas that individuals' beliefs about themselves and their abilities would influence learning and performance, scholars have argued that a group's belief about its capability to perform a specific objective (i.e., its collective efficacy) can influence the group's performance (for a review, see Gibson & Earley, 2007). Substantial research supports this idea (Gibson, 2001). In fact, meta-analytic data estimate the relationship between team efficacy and team performance to be strong and positive ($\rho = 0.41$, Gully, Incalcaterra, Joshi, & Beaubien, 2002). In the case of creativity, the degree to which individuals possess ''creative self-efficacy'' has been associated with creative outcomes (Jaussi, Randel, & Dionne, 2007; Redmond, Mumford, & Teach, 1993; Tierney & Farmer, 2002, 2004).

However, more efficacy is not necessarily always better. Even modestly inflated beliefs of the team's ability could have detrimental effects on the idea generation and evaluation phases of team innovation. If members are overconfident in their evaluation of the group's initial ideas, for example, the evaluation phase may be terminated prematurely and thus ultimately unsuccessful solution. This is consistent with research showing that a high need for closure was negatively related to creativity in groups (Chirumbolo et al., 2004), and with research that demonstrates a positive linkage between efficacy and satisfaction with the team's work (e.g., Mason & Griffin, 2003); in cases in which efficacy is high, teams may progress too quickly toward closure and be too easily satisfied with substandard ideas. Conversely, higher levels of collective efficacy may be critical in the implementation phases of innovation as it should be a strong motivator of the effort necessary to implement ideas and solutions (Klein & Sorra, 1996).

Conformity likely facilitates collective efficacy through social verification processes and self-esteem maintenance processes. Research in social psychology has demonstrated that individuals are generally motivated by two (mostly complementary) forces (Swann, Hixon, Stein-Seroussi, & Gilbert, 1990): (1) individuals are motivated to maintain a sense of self-worth, and (2) individuals are motivated to verify their self-perceptions to bolster their perceptions of control and predictability (Swann, Stein-Seroussi, & Giesler, 1992). Thus, most individuals engage in behaviors that are consistent with their positive self-views. Similar processes may emerge in teams; team members may engage in behaviors that are similar to their teammates in order to maintain their positive views of the social group as a whole (Swann, Polzer, Seyle, & Ko, 2004). These conforming behaviors, in turn, serve to reinforce the positive social perceptions thereby supporting group efficacy beliefs and ultimately facilitating idea implementation. This reciprocal relationship is depicted in Fig. 1. Put another way, conformity may give rise to collective efficacy through social verification processes, and collective efficacy may enable the successful implementation of ideas by inspiring and maintaining motivated efforts.

Despite the potential benefits of collective efficacy, achieving such efficacy in innovative teams can be challenging given the nature of innovation. Unlike established or routine processes, innovation is unpredictable. It involves choosing one idea or course of action over other, seemingly plausible alternatives (Kanter, 1988). In many, if not most innovative circumstances, the degree to which a given product, process, or idea is likely to improve the status quo or whether it can be successfully implemented, is largely unknown (West & Farr, 1990).

Because various alternatives are plausible, disagreement among team members about the "best" choice is extremely common (e.g., Kratzer, Leenders, & van Engelen, 2006). Such disagreement can result not only from team members placing different weight on the features or potential gains or drawbacks of different solutions, but also from the discrepant ways in which members conceptualize the problem space or the need to innovate at all (e.g., Mumford, Mobley, Uhlman, & Reiter-Palmon, 1991). Unfortunately, these disagreements about the best option and the suitability of the chosen option do not necessarily vanish once the team selects that option. The "price" of being wrong in implementing a new idea is high, as team members face potential derision from other organizational members in addition to potential career setbacks (e.g., not receiving a desired pay raise, Janssen, 2003; Schachter, 1951). Given the consequentiality of the team's decision and actions, members' initial doubts about the appropriateness of the chosen solution and about the team's ability to successfully navigate the organizational and logistical impediments to its implementation may remain; in turn, collective efficacy will suffer.

Proposition 5. There will be an inverse U-shaped relationship between collective efficacy and team effectiveness during idea generation and evaluation.

Proposition 6. Greater conformity with respect to collective efficacy will be associated with higher levels of team effectiveness during idea implementation.

THE ROLE OF LEADERS IN MANAGING CONFORMITY

The degree to which groups conform and, in turn, enjoy resultant performance benefits, is dependent upon various antecedent factors (see Fig. 1). While each of these factors is likely important, research suggests that group leadership is especially consequential in determining team innovation, including idea implementation (Mumford, Scott, Gaddis, & Strange, 2002; Reiter-Palmon & Illies, 2004).

One especially important role for the leader to play in the creative process is that of providing structure (Fleishman, 1973) at the appropriate place in the typically chaotic innovative process (e.g., Drazin et al., 1999). In fact, West et al. (2003) showed that innovation was more likely in teams with a clear leader than in teams whose leadership was shared or unclear. We suggest that, during the innovative process, effective leaders will impose different types of structure in the various phases. Specifically, we see team leaders as influencing creativity, innovation, and conformity (a) by creating an environment within the group that fosters innovative thinking and the exchange of creative ideas, and (b) by establishing shared expectations, norms, and team processes that foreclose subsequent brainstorming and inappropriate "solution-revisiting" activities by individual members after the group has reached closure on an idea, decision, or problem solution

With regard to idea generation, the leader serves as a facilitator during this phase by fostering a learning and exploring environment in the team, by acting as a coach and partner in such processes, and by providing feedback regarding process effectiveness (Zaccaro, Ely, & Shuffler, 2007). The leader facilitates the structuring of idea generation and consideration processes. Facilitation behaviors include helping group members (a) understand the nature of the creative problem they are confronting, (b) acquire information or knowledge needed to elaborate creative ideas or ground them in data, and (c) reflect upon what they are learning and thinking about the problem (Hackman & Wageman, 2005; Wilkens & London, 2006).

In addition to these behaviors, an especially important leader function at this point is to encourage members to contribute what may be risky ideas and proposed solutions. Indeed, the initiation of the creative process in groups rests in members offering what may be ideas that run contrary to current accepted performance strategies. Accordingly, members often exhibit a reluctance to break the existing group mind-set (Edmondson, Roberto, & Watkins, 2003; Zaccaro et al., 2007). The group leader will typically have the responsibility to counter such reluctance.

One way to do so is by establishing the psychological safety members need to feel in order to offer such ideas. Edmondson (1999) defined psychological safety as ''a shared belief that the team is safe for interpersonal risk taking'' (p. 354). Such safety fosters creative thinking because ''it alleviates excessive concern about others' reactions that have the potential for embarrassment or threat'' (p. 355). Leaders establish psychological safety by explicitly encouraging the exchange of different and innovative ideas, and admonishing any attempt to sanction or critique the offering of such ideas (note the ideas themselves can be critiqued; but not the fact of their offering) (Edmondson, 1999; Edmondson et al., 2001; Zaccaro et al., 2007). Related to this, the leader also can also promote greater idea exchange by reducing perceived power differentials in groups that inhibit members from speaking up (Edmondson, 2003). Edmondson argued that leaders need to encourage members to offer ideas and to indicate that their input is ''explicitly needed and desired by others'' (p. 1424). Such encouragement can increase the quantity of ideas offered.

Note that this idea exchange process can become quite conflicting. Thus, leaders also need to ensure that this conflict remains a constructive cognitive one and that it not become overly affective (Amason, 1996). Zaccaro et al. (2007) argued that leaders can facilitate an environment of ''constructive controversy'' (Ellis et al., 2003; Tjosvold & Deemer, 1980) by enhancing the collective identification and cohesion of the team – members who feel strongly bonded to the team are less likely to allow a diversity of expressed and opposing ideas devolve into acrimony. This cohesion needs to be paired with norms that foster idea exchange; otherwise, strong cohesion may heighten the concern about affective conflict so as to minimize the exchange of cognitive conflicting ideas (e.g., ''groupthink'' Janis, 1972).

Thus, we have argued that fostering the emergence of creative ideas necessitates the leader encouraging idea exploration and exchange among group members. However, at some point, the leader must foster team members to coalesce around the most promising idea or agree to an innovative solution. At this point, the opposite normative process needs to be inculcated. Members need to understand, and agree, that further exploration and idea revisiting is counterproductive to the implementation process of the group.

After fostering team members coalescing around the most promising idea, effective leaders then facilitate coordinated interactions among team members during idea implementation (Zaccaro, Rittman, & Marks, 2001). Specifically, at this point, effective leaders switch to a team regulation process around the goal path indicated by the implementation of a creative solution. They articulate a clear vision of a desired end state and link their expectations of individual team members to the attainment of this end state. Based on the leader's vision articulation, team members develop a shared mental model (Klimoski & Mohammed, 1994) of the team's future state, of their team members' roles and of their own roles, facilitating team innovation (Pearce & Ensley, 2004). Team norms at this point focus on the processes necessary to achieve this solution (Kane, Zaccaro, Tremble, & Masuda, 2002). Solutions are to be revisited only if their implementation reveals serious concerns, unforeseen impediments, or simply that they are not going to work. At that point, leaders should re-engage the collective creative process.

Note, the leader is not prescribing a clear structured path to this end state. Models of transformational leadership emphasize the leader's role in empowering members around a particular vision, motivating them to work hard on behalf of the organization (Bass, 1985; Bass & Avolio, 1993, 1994). This empowerment and motivation can in turn drive the energy for innovative within the team or organization. Indeed, Moss, McFarland, Ngu, and Kijowski (2007) found that individuals who were high in openness to experience (and therefore likely to be more creative in their approach to a problem) demonstrated higher organizational commitment when their leaders displayed a transformational leadership style. They noted that:

> Transformational leaders, who invite followers to challenge obsolete practices and introduce innovative alternatives, but also provide the confidence these individuals need to conquer contextual constraints (Bass, 1985), will tend to facilitate the expression of creativity, originality, and initiative as well as promote workplace change. Open individuals are thus more inclined to manifest their traits and experience a sense of commitment (p. 271).

We would also argue, however, that the members' commitment to the leader and to the organization can be a byproduct of transformational leadership (Avolio, Zhu, Koh, & Bhatia, 2004; Bono & Judge, 2003; Walumbwa & Lawler, 2003).

Thus, the role of the leader is to balance the creation of the necessary psychological safety, freedom and processes to help the group generate creative ideas, with the structure and conforming dynamics to implement the group-selected ideas. Accordingly, then, effective leaders are alternating between innovative and structuring activities depending upon how the group is progressing toward creative solutions. While they display one style of interaction within the group early in the creative process – one that is encouraging of innovation and unrestrictive regarding idea exchanges, they display a nearly opposite style later in the group creativity process, one that is more focused on production, and more restrictive of unhelpful interruptions of this process. Note that the leader must be able to manage the successful display of *both* interaction styles. Effective leaders can alternate among different leadership orientations, depending upon the functional requirements of group situations (Zaccaro, 2002). Such flexibility is a crucial attribute for leaders managing creativity and innovation within groups.

We have noted that a crucial aspect of this process entails the emergence of norms that at once favor creative processes in the innovative idea or solution generation process, and structuring processes later in the solution implementation process. Feldman (1984) argued that group norms can develop in four ways – through explicit statements from leaders or supervisors, critical events in the group's history, the initial behavior patterns that emerge in early group processes, and behavior patterns carried into the group by members formerly from other groups. We believe that because of the complexity of norms around the innovation process (i.e. fostering both creative thinking and team structuring behaviors at different times), leaders are likely to have the dominant influence on the emergence of such norms. Initial behavior patterns in the group may favor either innovation or structuring behaviors, but not the complexity of moving across these states. The same limitation is likely true of carry-over behaviors. Critical events can have an influence only if they help members understand the need for such norms; such understanding often derives from sense-giving processes by the leader (Zaccaro et al., 2001). Thus, at least for the emergence of the kinds of norms that foster effective integration of creative and structuring behavior patterns, we believe leadership processes likely represent the most significant driving force.

Proposition 7. There will be a positive relationship between leaders' capacity to foster innovative thinking along with the exchange of novel ideas and team effectiveness during idea generation and evaluation.

Proposition 8. There will be a positive relationship between team effectiveness and leaders' capacity to: prohibit delayed brainstorming and inappropriate "solution-revisiting" after idea generation (8a), express and establish shared norms and expectations (8b), and reevaluate and visit original ideas (8c) during idea implementation.

IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS

The arguments presented here point to several important directions for scholarly research and for management practice. First, with regard to research, we join a growing number of scholars who emphasize the importance of disentangling the distinct aspects of the innovation process (e.g., Farr et al., 2003; West, 2002). We offer a specific and testable proposition that necessitates consideration of separate phases: that behavioral conformity will negatively impact problem identification and idea generation and evaluation, but will positively affect idea implementation. In addition, we suggest that conformity facilitates the execution of ideas through the specific mechanisms of coordination, information exchange, conflict management, and efficacy. Tests of these propositions would advance scientific knowledge of team innovation.

Shifting from Nonconformity to Conformity

Moreover, deeper considerations of the constructs presented here highlight potential avenues for theoretical development. For example, our notions of the manner in which social verification processes might impact conformity and innovation through collective efficacy suggest that the relationship between efficacy and innovation, as well as social verification and conformity, deserve greater theoretical and empirical attention. As another example, the complex interpersonal dynamics that emerge between stages of the innovation process (e.g., resentment or anger when chosen idea is not one's own) also deserve focused attention. Aspects of interactional and procedural justice in intrateam dynamics may be key factors in transitioning from divergence to consensus.

More generally, we see great value in work exploring the processes and mechanisms that underlie team's propensity to shift from nonconformity during the idea generation stage to conformity during idea implementation. To investigate this issue, we propose that researchers consider employing a diversity of methodological approaches. For instance, using experience sampling methodology with organizational samples would allow one to assess team members' changing emotional states and justice perceptions across the various stages and therefore to examine how these affective experiences underlie the (non) conformity process (e.g., Weiss & Cropanzano, 1996). Case studies utilizing observational and qualitative approaches also could shed light on the intra- and inter-personal experiences and processes that impact conformity and determine teams' ability to effectively transition between the idea generation and idea implementation stages. In addition, laboratory studies using experimental manipulations or employing behavioral observation of team interaction processes (see Weingart, 1997), also would be beneficial.

In terms of such laboratory studies, one seemingly useful stream of research would be trying to identify the practical steps organizations can take in promoting conformity after the team generates the idea. Social psychological research provides several clues. For instance, scholars have documented the benefits of group members openly discussing, instead of avoiding, their disagreements in terms of subsequent cooperation (e.g., Kerr & Kaufman-Gilliland, 1994). In addition, several studies demonstrate that group members generally will work with the group when they have made a personal commitment to do so, even when such is not in their personal interest (Cialdini, 1984; Kerr, Garst, Lewandowski, & Harris, 1997). That is, when individuals agree to perform actions for the sake of the team, their internal norms of commitment and responsibility ensure they actually complete those tasks. Laboratory studies examining the benefits of having members openly discus their disagreements and also having them concretely state their intended implementation tasks would be relatively straightforward to implement and quite informative.

On a related note, we also perceive significant value in research exploring the effects of team composition throughout the innovative process. In particular, our above theorizing suggests that, because different levels of behavioral consistency are required at different stages, certain characteristics may be beneficial in one stage but detrimental in another. As an example, consider the Big Five personality trait of openness to experience. Openness is beneficial during idea generation (e.g., Feist, 1998; Zhang & Huang, 2001), presumably because it is associated with characteristics such as impulsivity, imaginativeness, curiosity, and originality (McCrae, 1987). However, these same characteristics could hamper implementation effectiveness. Instead of conforming to the implementation of the current idea, open individuals instead may continually question that idea, constantly seeking and proposing other novel and imaginative solutions. Thus, these individuals likely will delay or prevent the transition from idea generation to implementation. Based on this reasoning, we would predict that teams whose members are less open to experience are especially effective during this latter stage.

The converse may be true for the Big Five trait of agreeableness. Because agreeable individuals tend to prefer harmony and to avoid potential conflict (e.g., John, 1990), they likely refrain from proposing alternative ideas or from commenting upon others' ideas during the idea generation stage. That is, they conform *too quickly and easily*. At least one empirical study supports this idea (Putman, 2002). However, this same propensity to conform should be beneficial during implementation. Laboratory or field studies in which researchers measure these characteristics as well as others (e.g., demographic similarity) and then assess their relationships with team effectiveness during the different stages would be quite informative.

To this point, we have focused on the nature of processes that emerge when a team comprised of static group members engages in the innovation process. An alternative approach altogether would involve utilizing different teams (or teams comprised of different members) at different stages of the innovation process. This approach might facilitate the stage-specific optimal team composition with regard to personality and with regard to behavioral norms. However, this approach also presents some potential difficulties. For instance, information or ideas might also be lost in transition between members or teams. Similarly, the two teams may possess dissimilar mental models regarding the nuances of the idea and of its implementation (Cannon-Bowers et al., 1993). Additional research is needed to compare and contrast the relative utility of static and dynamic team compositions in innovation.

Groups Revisiting Failing Ideas

In addition to studying how teams transition from the earlier stages to the latter one and from nonconformity to conformity, work exploring the converse would also be intriguing. The innovative process is often nonlinear and iterative, as individuals and groups constantly must monitor and revisit their ideas and make appropriate adjustments (e.g., Anderson et al., 2004; Drazin et al., 1999). According to the ideas presented above, groups seemingly face a dilemma. To the degree that members act in a uniform and conforming manner, they may fail to appropriately monitor the effectiveness of their idea during its implementation due to their beliefs in its correctness (e.g., Haslam et al., 2006). As a result, the team risks not recognizing signs that the project is failing and, therefore, it may continue on a potentially disastrous path, rather than revisiting the initial idea or considering previously mentioned alternatives.

In one sense, this concern does not necessarily follow from the present treatment of conformity. As is evident throughout this paper, conformity, as discussed here, entails conforming despite, not because of, agreement with other team members. To the extent that team members retain their initial concerns and preferences, the group should not succumb to the type of ''groupthink'' alluded to above.

A more realistic concern, however, may be that these minority members refrain from mentioning their concerns to the team during implementation, either out of resentment for having their earlier ideas squelched (Janssen, 2003), or for fear of further reprisal from the group (De Dreu & De Vries, 1997). Indeed, when these members do express such concerns, the rest of the group may view them as obstinate or as failing to align themselves with the group objective. In other words, such members may be conforming, in that they have the team's best interest in mind and they are still dutifully working in implementing the idea. However, their teammates may not perceive them as conforming to the extent that such members continue expressing doubts or concerns about the project.

Efforts to identify the contextual and team variables that predict these ''dissident'' members' willingness to voice their concerns and to do in a constructive manner would be enlightening as would efforts to determine what predicts the team's willingness to acknowledge these concerns. Other research suggests, for instance, that teams who exhibit cohesion (Beal et al., 2003) and trust (Edmondson et al., 2001) would be especially likely to engage in such activities. In addition, teams who reflect on their actions and communication processes also are more receptive to ideas voiced by minority members (De Dreu, 2002). Examining the role of these and other variables in determining if and when teams reconsider their initial ideas and perhaps abandon those ideas for alternatives would be useful, and seems particularly well suited for study in a laboratory setting.

Conceptual and Empirical Clarity of Conformity

Another important implication of this model is in regard to the need for conceptual and empirical clarity in terms of conformity. Conceiving of conformity as observable behavior(s) related to innovation suggests that it is an important antecedent or dimension of individual and team job performance (Campbell, 1990). Conformity may be an especially meaningful and consequential aspect of performance (and managing conformity may be a critical leader competency) for organizations that operate in turbulent markets, that rely on technological advancements for new products and services, that are undergoing structural change (e.g., a merger, expansion, or downsizing), or that continuously introduce new equipment into the workplace (e.g., hospitals). Empirical efforts to measure conformity behavior, through supervisory or peer ratings, for instance, would be informative, especially insofar as these ratings are related to critical group processes such as coordination, information sharing, and conflict.

This model also suggests that there is value in determining the degree to which conformity, as a behavior, is malleable and transient. While the willingness to conform might be related to stable personality characteristics such as agreeableness (John, 1990), individuals most likely vary in their propensity to conform to the group over time. In particular, the current model emphasizes that conformity is susceptible to contextual and social factors. Thus, individuals' decision to match their behavior to those of the other group members likely depends on factors such as members' attitudes toward the idea, the group's prior success in implementing creative ideas, and the effectiveness of the team's leader. Thus, organizations may take numerous approaches to influencing conformity such as changing (or training) team leadership, rewarding team successes, and increasing efficacy through training and motivational interventions.

Another practical implication of our theorizing is that innovation may be most successful in situations in which organizational leaders (e.g., team leaders, managers) recognize and respond to shifting needs within creative teams. In particular, leaders need to develop skills that help them to shape and change group norms efficiently. Effective leadership in the area of creativity and innovation may be better understood by attention to the dynamic nature of creative tasks and the power of group norms of behavior.

CONCLUSION

In conclusion, the positive effects of divergence in behaviors and opinions during problem identification, idea generation, and idea evaluation phases of innovation may backfire when teams turn to the task of implementing ideas. The coordination, information sharing, lack of conflict, and efficacy required to implement ideas successfully may be better supported by team members' conformity to the preferred behaviors. Given these recognitions, team leaders face the difficult challenge of managing conforming pressures such that divergence is created in the early stages of innovation and minimized when ideas are put into practice. Researchers and practitioners have an opportunity to attend to the temporal dynamics of team innovation and factors that facilitate or inhibit success in each phase of the innovative process.

REFERENCES

Allen, V. (1965). Situational factors in conformity. In: L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 2, pp. 133–170). New York: Academic Press.

Amabile, T. M. (1996). *Creativity in context: Update to 'The Social Psychology of Creativity'.* Boulder, CO: Westview Press.

Amabile, T. M. (1988). From individual creativity to organizational innovation. In: K. Gronhaug & G. Kaufmann (Eds), *Innovation: A cross-disciplinary perspective, 6* (pp. 139–166). Oslo, Norway: Norwegian University Press.

Amason, A. C. (1996). Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy of Management Journal*, *39*, 123–148.

Ancona, D. G. (1990). Outward bound: Strategies for team survival in an organization. *Academy of Management Journal*, *33*, 334–365.

Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization Science*, *3*, 321–341.

Anderson, N., De Dreu, C. K. W., & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, *25*, 147–173.

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, *19*, 235–258.

Asch, S. E. (1955). Opinions and social pressure. *Scientific American*, *193*, 31–35.

Avolio, B. J., Zhu, W., Koh, W., & Bhatia, P. (2004). Transformational leadership and organizational commitment: Mediating role of psychological empowerment and moderating role of structural distance. *Journal of Organizational Behavior*, *25*, 951–968.

Baldridge, J. V., & Burnham, R. A. (1975). Organizational innovation: Individual, organizational, and environmental impacts. *Administrative Science Quarterly*, *20*, 165–176.

Bantel, K., & Jackson, S. (1989). Top management and innovations in banking: Does the composition of the top team make a difference? *Strategic Management Journal*, *10*, 107–124.

Bartis, S., Szymanski, K., & Harkins, S. G. (1988). Evaluation and performance: A two-edged knife. *Personality and Social Psychology Bulletin*, *14*, 242–251.

Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York: Free Press.

Bass, B. M., & Avolio, B. J. (1993). Transformational leadership: A response to critiques. In: M. M. Chemers & R. Ayman (Eds), *Leadership theory and research* (pp. 49–800). San Diego, CA: Academic Press.

Bass, B. M., & Avolio, B. J. (1994). *Improving organizational effectiveness through transformational leadership*. Thousand Oaks, CA: Sage.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–529.

Beal, D. J., Cohen, R. R., Burke, M. J., & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology*, *88*, 989–1004.

Bono, J. E., & Judge, T. A. (2003). Self-concordance at work: Toward understanding the motivational effects of transformational leaders. *Academy of Management Journal*, *46*, 554–571.

Bornstein, G., & Ben-Yossef, M. (1994). Cooperation in intergroup and single-group social dilemmas. *Journal of Experimental Social Psychology*, *30*, 52–67.

Brodbeck, F. C., Kerschreiter, R., Mojzisch, A., Frey, D., & Schulz-Hardt, S. (2002). The dissemination of critical, unshared information in decision-making groups: The effects of pre-discussion dissent. *European Journal of Social Psychology*, *32*, 35–56.

Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlesssly shifting organizations. *Administrative Science Quarterly*, *42*, 1–34.

Bushe, G. R. (1988). Cultural contradictions of statistical process control in American manufacturing organizations. *Journal of Management*, *14*, 19–31.

Caldwell, D. F., & O'Reilly, C. A., III. (2003). The determinants of team-based innovation in organizations. The role of social influence. *Small Group Research*, *34*, 497–517.

Camacho, L. M., & Paulus, P. B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology*, *68*, 1071–1080.

Campbell, J. P. (1990). Modeling the performance prediction problem in industrial and organizational psychology. In: M. D. Dunnette & L. M. Hough (Eds), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 1, pp. 687–732). Palo Alto, CA: Consulting Psychologists Press, Inc.

Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision making. In: N. J. Castellan, Jr. (Ed.), *Individual and group decision making: Current issues* (pp. 221–246). Hillsdale, NJ: LEA, 315pp.

Chirumbolo, A., Livi, S., Mannetti, L., Pierro, A., & Kruglanski, A. W. (2004). Effects of need for closure on creativity in small group interactions. *European Journal of Personality*, *18*, 265–278.

Christensen, P. R., Guilford, J. P., & Wilson, R. C. (1957). Relations of creative responses to working time and instructions. *Journal of Experimental Psychology*, *53*, 82–88.

Cialdini, R. B. (1984). *Influence: The new psychology of modern persuasion*. New York: Quill Publishing.

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, *55*, 591–621.

De Cremer, D., & Van Knippenberg, D. (2002). How do leaders promote cooperation? The effects of charisma and procedural fairness. *Journal of Applied Psychology*, *87*, 858–866.

De Dreu, C. K. W. (2002). Team innovation and team effectiveness: The importance of minority dissent and reflexivity. *European Journal of Work and Organizational Psychology*, *11*, 285–298.

De Dreu, C. K. W., & De Vries, N. K. (1997). Minority dissent in organizations. In: C. De Dreu & E. Van De Vliert (Eds), *Using conflict in organizations* (pp. 72–86). London, UK: Sage.

De Dreu, C. K. W., & van Knippenberg, D. (2005). The possessive self as a barrier to conflict resolution: Effects of mere ownership, process accountability, and self-concept clarity on competitive cognitions and behavior. *Journal of Personality and Social Psychology*, *89*, 345–357.

De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, *88*, 741–749.

De Jong, J. P. J., & Kemp, R. (2003). Determinants of co-workers innovative behaviour: An investigation into knowledge intensive services. *International Journal of Innovation Management*, *7*, 189–212.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.

Diehl, M., & Stroebe, W. (1991). Productivity loss in idea-generating groups: Tracking down the blocking effect. *Journal of Personality and Social Psychology*, *61*, 392–403.

Drach-Zahavy, A., & Somech, A. (2001). Understanding team innovation: The role of team processes and structures. *Group Dynamics*, *5*, 111–123.

Drach-Zahavy, A., Somech, A., Granot, M., & Spitzer, A. (2004). Can we win them all? Benefits and costs of structured and flexible innovation-implementations. *Journal of Organizational Behavior*, *25*, 217–234.

Drazin, R., Glynn, M. A., & Kazanjian, R. K. (1999). Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review*, *24*, 286–307.

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*, 350–383.

Edmondson, A. C., Bohmer, R. M., & Pisano, G. P. (2001). Disrupted routines: Team learning and new technology implementation in hospitals. *Administrative Science Quarterly*, *46*, 685–716.

Edmondson, A. C., Roberto, M. A., & Watkins, M. D. (2003). A dynamic model of top management team effectiveness: Managing unstructured task streams. *Leadership Quarterly*, *14*, 297–325.

Edmondson, A. (2003). Speaking up in the operating room: How team leaders promote learning in interdisciplinary action teams. *Journal of Management Studies*, *40*, 419–1452.

Eisemann, R. (1990). Creativity, preference for complexity, and physical and mental illness. *Creativity Research Journal*, *3*, 231–236.

Ellis, A. P., Hollenbeck, J. R., Ilgen, D. R., Porter, C. O., West, B. J., & Moon, H. (2003). Team learning: Collectively connecting the dots. *Journal of Applied Psychology*, *88*, 821–835.

Farr, J. L., Sin, H.-P., Tesluk, P. E., & Shavinina, L. V. (2003). *Knowledge management processes and work group innovation*. New York: Elsevier Science.

Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, *2*, 290–309.

Feldman, D. C. (1984). The development and enforcement of group norms. *Academy of Management Review*, *9*, 47–53.

Fleishman, E. A. (1973). Twenty years of consideration and structure. In: E. A. Fleishman & J. G. Hunt (Eds), *Current developments in the study of leadership*. Carbondale, IL: Southern Illinois University Press.

Flynn, F. J., Chatman, J. A., & Spataro, S. E. (2001). Getting to know you: The influence of personality on impressions and performance of demographically different people in organizations. *Administrative Science Quarterly*, *46*, 414–442.

Ford, C., & Sullivan, D. M. (2004). A time for everything: How the timing of novel contributions influences project team outcomes. *Journal of Organizational Behavior*, *25*, 279–292.

Gersick, C. J. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal*, *31*, 9–41.

Gibson, C. B. (2001). From knowledge accumulation to accommodation: Cycles of collective cognition in work groups. *Journal of Organizational Behavior*, *22*, 121–134.

Gibson, C. B., & Earley, P. C. (2007). Collective cognition in action: Accumulation interaction, examination, and accommodation in the development and operation of group efficacy beliefs in the workplace. *Academy of Management Review*, *32*, 438–458.

Goncalo, J. A., & Duguid, M. M. Strong norms as a stimulant to group creativity: When conformity pressure facilitates the expression of creative ideas (unpublished manuscript).

Goncalo, J. A., & Staw, B. M. (2006). Individualism-collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*, 96–109.

Greitemeyer, T., & Schulz-Hardt, S. (2003). Preference-consistent evaluation of information in the hidden profile paradigm: Beyond group-level explanations for the dominance of shared information in group decisions. *Journal of Personality & Social Psychology*, *84*, 322–339.

Guastello, S. J., & Guastello, D. D. (1998). Origins of coordination and team effectiveness: A perspective from game theory and nonlinear dynamics. *Journal of Applied Psychology*, *83*, 423–437.

Gully, S. M., Incalcaterra, K. A., Joshi, A., & Beaubien, J. (2002). A meta-analysis of team-efficacy, potency, and performance: Interdependence and level of analysis as moderators of observed relationships. *Journal of Applied Psychology*, *87*, 819–832.

Gurtner, A., Tschan, F., Semmer, N. K., & Naegele, C. (2007). Getting groups to develop good strategies: Effects of reflexivity interventions on team process, team performance, and shared mental models. *Organizational Behavior and Human Decision Processes*, *102*, 127–142.

Hackman, J. R., & Wageman, R. (2005). A theory of team coaching. *Academy of Management Review*, *30*, 269–287.

Hackman, R. J., & Wageman, R. (1995). Total quality management: Empirical, conceptual, and practical issues. *Administrative Science Quarterly*, *40*, 309–342.

Hardin, G. (1968). The tragedy of the commons. *Science*, *162*, 1243–1248.

Harrison, M. M., Neff, N. L., Schwall, A. R., & Zhao, X. (2006). *A meta-analytic investigation of individual creativity and innovation*. Paper presented at the 21st Annual Conference, Society of Industrial and Organizational Psychology (SIOP), Dallas, TX.

Haslam, S. A., Ryan, M. K., Postmes, T., Spears, R., Jetten, J., & Webley, P. (2006). Sticking to our guns: Social identity as a basis for the maintenance of commitment to faltering organizational projects. *Journal of Organizational Behavior*, *27*, 607–628.

Hill, G. W. (1982). Group versus individual performance: Are N+1 heads better than one? *Psychological Bulletin*, *91*, 517–539.

Hood, W. R., & Sherif, M. (1962). Verbal report and judgment of an unstructured stimulus. *Journal of Psychology: Interdisciplinary and Applied*, *54*, 121–130.

Ilgen, D. (1999). Teams embedded in organizations: Some implications. *American Psychologist*, *54*, 129–139.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process–output models to IMOI models. *Annual Review of Psychology*, *56*, 517–543.

James, K., Chen, J., & Goldberg, C. (1992). Organizational conflict and individual creativity. *Journal of Applied Social Psychology*, *22*, 545–566.

Janis, I. L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes*. Oxford, UK: Houghton Mifflin.

Janssen, O. (2003). Innovative behaviour and job involvement at the price of conflict and less satisfactory relations with co-workers. *Journal of Occupational and Organizational Psychology*, *76*, 347–364.

Janssen, O., van de Vliert, E., & West, M. (2004). The bright and dark sides of individual and group innovation: A Special Issue introduction. *Journal of Organizational Behavior*, *25*, 129–145.

Jaussi, K. S., Randel, A. E., & Dionne, S. D. (2007). I am, I think I can, and I do: The role of personal identity, self-efficacy and cross-application of experiences in creativity at work. *Creativity Research Journal*, *19*, 247–258.

Jehn, K. A., & Mannix, E. A. (2001). The dynamic nature of conflict: A longitudinal study of intragroup conflict and group performance. *Academy of Management Journal*, *44*, 238–251.

John, O. P. (1990). The "big five" factor taxonomy: Dimensions of personality in the natural language and in questionnaires. In: L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 66–100). New York: Guildford.

Kane, T. D., Zaccaro, S. J., Tremble, T., & Masuda, A. D. (2002). An examination of the leader's regulation of groups. *Small Group Research*, *33*, 65–120.

Kanter, R. M. (1988). Three tiers for innovation research. *Communication Research*, *15*, 509–523.

Keller, R. T. (2001). Cross-functional project groups in research and new product development: Diversity, communications, job stress, and outcomes. *Academy of Management Journal*, *44*, 547–559.

Kerr, N. L., Garst, J., Lewandowski, D. A., & Harris, S. E. (1997). That still, small voice: Commitment to cooperate as an internalized versus a social norm. *Personality and Social Psychology Bulletin*, *23*, 1300–1311.

Kerr, N. L., & Kaufman-Gilliland, C. M. (1994). Communication, commitment, and cooperation in social dilemmas. *Journal of Personality and Social Psychology*, *66*, 513–529.

Kiesler, C. A., Zanna, M., & Desalvo, J. (1966). Deviation and conformity: Opinion change as a function of commitment, attraction, and presence of a deviate. *Journal of Personality and Social Psychology*, *3*, 458–467.

Klein, K. J., Conn, A. B., & Sorra, J. S. (2001). Implementing computerized technology: An organizational analysis. *Journal of Applied Psychology*, *86*, 811–824.

Klein, K. J., & Knight, A. P. (2005). Innovation implementation: Overcoming the challenge. *Current Directions in Psychological Science*, *14*, 243–246.

Klein, K. J., & Ralls, R. S. (1995). The organizational dynamics of computerized technology implementation: A review of the empirical literature. In: L. R. Gomez-Mejia & M. W. Lawless (Eds), *Implementation management of high technology* (pp. 31–79). Greenwich, CT: JAI Press.

Klein, K. J., & Sorra, J. S. (1996). The challenge of innovation implementation. *Academy of Management Review*, *21*, 1055–1080.

Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor? *Journal of Management*, *20*, 403–437.

Kozlowski, S. W. J., Gully, S. M., Nason, E. R., & Smith, E. M. (1999). Developing adaptive teams: A theory of compilation and performance across levls and time. In: D. R. Ilgen & E. D. Pulakos (Eds), *The changing nature of performance* (pp. 240–292). San Francisco, CA: Jossey-Bass Inc.

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, *7*, 77–124.

Kratzer, J., Leenders, R. T. A. J., & van Engelen, J. M. L. (2006). Team polarity and creative performance in innovation teams. *Creativity and Innovation Management*, *15*, 96–104.

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: 'Seizing' and 'freezing'. *Psychological Review*, *103*, 263–283.

Marks, M. (1999). A test of the impact of collective efficacy in routine and novel performance environments. *Human Performance*, *12*, 295–309.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review*, *26*, 356–375.
Mason, C. M., & Griffin, M. A. (2003). Identifying group task satisfaction at work. *Small Group Research*, *34*, 413–442.
McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of Personality and Social Psychology*, *52*, 1258–1265.
Milgram, S. (1963). Behavioral Study of obedience. *The Journal of Abnormal and Social Psychology*, *67*, 371–378.
Moss, S. A., McFarland, J., Ngu, S., & Kijowski, A. (2007). Maintaining an open mind to closed individuals: The effects of resource availability and leadership style on the association between openness to experience and organizational commitment. *Journal of Research in Personality*, *41*, 259–275.
Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and performance: An integration. *Psychological Bulletin*, *115*, 210–227.
Mumford, M. D., Mobley, M. I., Uhlman, C. E., & Reiter-Palmon, R. (1991). Process analytic models of creative capacities. *Creativity Research Journal*, *4*, 91–122.
Mumford, M. D., Scott, G. M., Gaddis, B., & Strange, J. M. (2002). Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly*, *13*, 705–750.
Nail, P. R., MacDonald, G., & Levy, D. A. (2000). Proposal of a four-dimensional model of social response. *Psychological Bulletin*, *126*, 454–470.
Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, *93*, 23–32.
Nemeth, C. J., & Goncalo, J. A. (2005). Influence and Persuasion in Small Groups. In: S. Shavitt & T. C. Brock (Eds), *Persuasion: Psychological insights and perspectives* (2nd ed., pp. 171–194). Thousand Oaks, CA US: Sage Publications, Inc.
Nemeth, C. J., Personnaz, B., Personnaz, M., & Goncalo, J. A. (2004). The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology*, *34*, 365–374.
Nemeth, C. J., Staw, B. M. (1989). The tradeoffs of social control and innovation in groups and organizations. In: Berkowitz, L. (Ed.), *Advances in experimental social psychology* (Vol. 22, pp. 175–210). San Diego, CA US: Academic Press.
Nemeth, C. J., & Wachtler, J. (1983). Creative problem solving as a result of majority vs. minority influence. *European Journal of Social Psychology*, *13*, 45–55.
Nijstad, B. A., & Stroebe, W. (2006). How the group affects the mind: A cognitive model of idea generation in groups. *Personality and Social Psychology Review*, *10*, 186–213.
Ohly, S., Sonnentag, S., & Pluntke, F. (2006). Routinization, work characteristics and their relationships with creative and proactive behaviors. *Journal of Organizational Behavior*, *27*, 257–279.
Paulus, P. B., & Yang, H.-C. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior & Human Decision Processes*, *82*, 76–87.
Pearce, C. L., & Ensley, M. D. (2004). A reciprocal and longitudinal investigation of the innovation process: The central role of shared vision in product and process innovation teams (PPITs). *Journal of Organizational Behavior*, *25*, 259–278.
Pearsall, M. J., Ellis, A. P. J., & Evans, J. M. (2008). Unlocking the effects of gender faultlines on team creativity: Is activation the key? *Journal of Applied Psychology*, *93*, 225–234.
Pelled, L. H. (1996). Demographic diversity, conflict, and work group outcomes: An intervening process theory. *Organization Science*, *7*, 615–631.

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, *28*, 89–106.

Pfeffer, J. (1994). *Competitive advantage through people*. Boston, MA: Harvard Business School Press.

Pfeffer, J., & Sutton, R. I. (2000). *The knowing-doing gap*. Boston, MA: Harvard University Press.

Postmes, T., Spears, R., & Cihangir, S. (2001). Quality of decision making and group norms. *Journal of Personality and Social Psychology*, *80*, 918–930.

Putman, V. L. (2002). *Effects of additional rules and dominance on brainstorming and decision making*. Ann Arbor, MI: ProQuest Information & Learning.

Redmond, M. R., Mumford, M. D., & Teach, R. (1993). Putting creativity to work: Effects of leader behavior on subordinate creativity. *Organizational Behavior and Human Decision Processes*, *55*, 120–151.

Reiter-Palmon, R., & Illies, J. J. (2004). Leadership and creativity: Understanding leadership from a creative problem-solving perspective. *The Leadership Quarterly*, *15*, 55–77.

Rietzschel, E. F., De Dreu, C. K. W., & Nijstad, B. A. (2007). Personal need for structure and creative performance: The moderating influence of fear of invalidity. *Personality and Social Psychology Bulletin*, *33*, 855–866.

Runco, M. A. (2004). Creativity. *Annual Review of Psychology*, *55*, 657–687.

Schachter, S. (1951). Deviation, rejection, and communication. *The Journal of Abnormal and Social Psychology*, *46*, 190–207.

Schneider, S. K., & Northcraft, G. B. (1999). Three social dilemmas of workforce diversity in organizations: A social identity perspective. *Human Relations*, *52*, 1445–1467.

Schweiger, D. M., & Denisi, A. S. (1991). Communication with employees following a merger: A longitudinal field experiment. *Academy of Management Journal*, *34*, 110–135.

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, *37*, 580–607.

Sethi, R., Smith, D. C., & Park, C. W. (2001). Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research*, *37*, 73–85.

Somech, A. (2006). The effects of leadership style and team process on performance and innovation in functionally heterogeneous teams. *Journal of Management*, *32*, 132–157.

Souder, W. E. (1987). *Managing new product innovations*. Boston, MA: Lexington Books.

Stasser, G., Kerr, N. L., & Davis, J. H. (1989). Influence processes and consensus models in decision-making groups. In: P. B. Paulus (Ed.), *Psychology of group influence* (2nd ed., pp. 279–326). England: Lawrence Erlbaum Associates, Inc.

Stasser, G., & Titus, W. (1985). Pooling of unshared information in group decision making: Biased information sampling during discussion. *Journal of Personality and Social Psychology*, *48*, 1467–1478.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic.

Swann, W. B., Hixon, J. G., Stein-Seroussi, A., & Gilbert, D. T. (1990). The fleeting gleam of praise: Cognitive processes underlying behavioral reactions to self-relevant feedback. *Journal of Personality and Social Psychology*, *59*, 17–26.

Swann, W. B., Jr., Polzer, J. T., Seyle, D. C., & Ko, S. J. (2004). Finding value in diversity: Verification of personal and social self-views in diverse groups. *Academy of Management Review*, *29*, 9–27.

Swann, W. B., Stein-Seroussi, A., & Giesler, R. B. (1992). Why people self-verify. *Journal of Personality and Social Psychology*, *62*, 392–401.
Tesluk, P. E., & Mathieu, J. E. (1999). Overcoming roadblocks to effectiveness: Incorporating management of performance barriers into models of work group effectiveness. *Journal of Applied Psychology*, *84*, 200–217.
Thomas, K. W., & Schmidt, W. H. (1976). A survey of managerial interests with respect to conflict. *Academy of Management Journal (pre-1986)*, *19*, 315.
Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, *45*, 1137–1148.
Tierney, P., & Farmer, S. M. (2004). The Pygmalion process and employee creativity. *Journal of Management*, *30*, 413–432.
Tjosvold, D. (1991). Rights and responsibilities of dissent: Cooperative conflict. *Employee Responsibilities and Rights Journal*, *4*, 13–23.
Tjosvold, D. (1998). Making employee involvement work: Cooperative goals and controversy to reduce costs. *Human Relations*, *51*, 201–214.
Tjosvold, D., & Deemer, D. K. (1980). Effects of controversy within a cooperative or competitive context on organizational decision making. *Journal of Applied Psychology*, *65*, 590–595.
Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, *44*, 996–1004.
van Offenbeek, M. A. G., & Koopman, P. L. (1996). Scenarios for system development: Matching context and strategy. *Behaviour & Information Technology*, *15*, 250–265.
Waller, M. J. (1999). The timing of adaptive group responses to nonroutine events. *Academy of Management Journal*, *42*, 127–137.
Walumbwa, F. O., & Lawler, J. J. (2003). Building effective organizations: Transformational leadership, collectivistic orientation, work-related attitudes, and withdrawal behaviors in three emerging economies. *International Journal of Human Resource Management*, *14*, 1083–1101.
Weingart, L. E. (1997). *How did they do that? The ways and means of studying group process.* Greenwich, CT: JAI Pres.
Weiss, H. M., & Cropanzano, R. (1996). Affective events theory: A theoretical discussion of the structure, causes and consequences of affective experiences at work. In: B. M. Staw & L. L. Cummings (Eds), *Research in organizational behavior: An annual series of analytical essays and critical reviews* (Vol. 18, pp. 1–74). Stamford, CT: JAI Press, Inc.
West (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review*, *51*, 355–387.
West, & Anderson, N. R. (1996). Innovation in top management teams. *Journal of Applied Psychology*, *81*, 680–693.
West, M. A., Borrill, C. S., Dawson, J. F., Brodbeck, F., Shapiro, D. A., & Haward, B. (2003). Leadership clarity and team innovation in health care. *Leadership Quarterly*, *14*, 393–410.
West, M. A., & Farr, J. L. (1990). *Innovation and creativity at work: Psychological and organizational strategies.* Oxford, UK: John Wiley & Sons.
Wilkens, R., & London, M. (2006). Relationships between climate, process, and performance in continuous quality improvement groups. *Journal of Vocational Behavior*, *69*, 510–523.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*, 293–321.

Zaccaro, S. J. (2002). Organizational leadership and social intelligence. In: R. E. Riggio & S. E. Murphy (Eds), *Multiple intelligences and leadership* (pp. 29–54). Mahwah, NJ: Lawrence Erlbaum Associates.

Zaccaro, S. J., Ely, K., & Shuffler, M. (2007). The leader's role in group learning. In: V. S. M. London (Ed.), *Work group learning* (pp. 193–214). New York: Lawrence Erlbaum.

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *Leadership Quarterly*, *12*, 451–483.

Zhang, L.-F., & Huang, J. (2001). Thinking styles and the five-factor model of personality. *European Journal of Personality*, *15*, 465–476.

Zhou, J., & Shalley, C. E. (2003). Research on employee creativity: A critical review and directions for future research. In: J. J. Martocchio & G. R. Ferris (Eds), *Research in personnel and human resources management* (Vol. 22, pp. 165–217). Oxford, UK: Elsevier Science Ltd.

STICKING TOGETHER: THE GLUE ROLE AND GROUP CREATIVITY

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ABSTRACT

In this paper, we introduce the concept of the "glue role" in groups engaged in creative tasks. An individual crafts a glue role by seeking out and taking on otherwise neglected tasks that have the potential to facilitate a creative group's performance. We adopt a negotiated order perspective on roles in groups to examine how a group's emerging social structure provides opportunities for crafting the glue role. We then suggest two mechanisms through which the glue role can facilitate performance in creative groups: the coordination of group members' contributions and the management of group conflict.

In a pharmaceutical research and development group, a technical analyst offers to help with an obscure statistical methodology that facilitates a breakthrough drug production process. This individual works vigorously with the scientists to interpret and write up the results, but is only mentioned in a small footnote when the group's lead scientists pitch the innovation to the company's top management.

An academic committee has a member who customarily takes assiduous notes at each meeting. At first, the other members of the committee think that this person is a little obsessive. However, as the time comes for the committee to begin to put together its final

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report, the other members of the committee find themselves going to this note-taker for specific details that they can use in their report that no one else can remember. The committee successfully completes and delivers its report to institutional stakeholders.

Collaborative creativity in work groups is increasingly acknowledged as a critical element to the success of organizations in a rapidly changing world (Paulus & Nijstad, 2003). However, the success of groups engaged in creative endeavors hinges, in part, on their ability to manage the paradoxes and dilemmas that often accompany group interactions (Smith & Berg, 1987). A situation that leads to a dilemma frequently associated with working in creative groups is that group members may be selected primarily for their expertise in functional areas or for the specialized skills that they can contribute to the group rather than their knowledge and skill in enacting teamwork (Marks, Sabella, Burke, & Zaccaro, 2002). The creative group, then, is positioned on the horns of a dilemma. On the one hand, creative task performance is thought to benefit from selecting talented group members with a diverse set of skills and abilities (Milliken, Bartel, & Kurtzberg, 2003). On the other hand, even the most talented collection of group members requires effective means of coordinating individual efforts to ensure that the group works together in pursuit of its goals (Van de Ven, Delbecq, & Koenig, 1976). To the extent that group members focus on individual pursuits to the exclusion of teamwork, group members may encounter difficulties in working as an interdependent entity (Ellis, Bell, Ployhart, Hollenbeck, & Ilgen, 2005; Hollenbeck, DeRue, & Guzzo, 2004).

In this paper, we seek to identify and better understand the phenomenon of the glue role in small groups engaged in creative tasks. An individual enacts a glue role by seeking out and taking on otherwise neglected tasks that have the potential to facilitate group effectiveness, but which often do not receive much recognition or attention. The glue role is contextually defined, driven by individuals' ability to adapt their behaviors to meet the needs of the group. Individuals are able to craft the glue role through their ongoing ability to recognize "windows of opportunity" (Tyre & Orlikowski, 1994) for adopting otherwise neglected tasks with the potential to facilitate the integration and coordination of group members' efforts. We suggest that this ability to take on neglected tasks that integrate group members' contributions can facilitate a creative group's performance by enabling better group coordination and by cultivating intragroup relationships built on trust that can facilitate the management of group conflict.

We seek to contribute to theory and research on group creativity by examining the glue role as a mechanism through which collective forms of creativity are accomplished in groups. We begin by introducing and defining the concept of the glue role as an example of how individuals can enact specific roles to influence group performance (Stewart, Fulmer, & Barrick, 2005). Drawing on the negotiated order perspective (Bechky, 2006; Strauss, 1978), we then provide a theoretical account of how individuals craft the glue role in response to a group's emerging social structures. Levine and Moreland (1990) point out how researchers know relatively little about the ways in which individual roles form in groups and this paper begins to examine that question. Finally, we discuss the ways in which the glue role may facilitate coordination and conflict management in groups.

GROUP CREATIVITY AND THE INDIVIDUAL

We define group creativity as a collective process whereby the diverse skills, knowledge, and perceptions of group members are coordinated to produce a product or performance that is both novel and appropriate for its intended purposes. Our definition can be unpacked into two key components. First, we view group creativity as a collective process (Sawyer, 2003), which requires the coordination of members' diverse abilities and perceptions to facilitate group effectiveness (Taggar, 2002). We follow Hargadon and Bechky (2006) in suggesting that much of a collective's creative activity occurs in the interactions of individuals with diverse perspectives and frames of reference. A creative group can enable individuals with diverse perspectives to come together and to interact, but it also requires means of integrating those efforts to be successful (Van de Ven et al., 1976). Second, we draw on Amabile's (1996) definition of creativity as producing a product or performance that is both novel and appropriate to the purposes for which it is intended.

Although researchers have pointed out that a good deal of creative activity is now accomplished in groups (Sutton & Hargadon, 1996; Sawyer, 2003), creativity is still popularly viewed largely as an individual phenomenon (Paulus & Nijstad, 2003). Recognition for great innovations often accrues to individuals like Thomas Edison, even though "Edison [was] in reality a collective noun and refers to the work of many men" (Conot, 1979, p. 469). This suggests that individuals who are able to take on visible, prominent group roles have the potential to receive individual recognition for some of the creative achievements of the group.

In the context of group creativity, individual group members' desire for individual recognition can play out in ways that have material consequences for group effectiveness. The desire of group members to seek visible, prominent group roles in which they will be personally recognized for their individual performance may conflict with their willingness to take on whatever role is necessary to integrate and coordinate group members' efforts. Without individuals willing to take on a variety of roles that perform different functions, groups struggle to function optimally (Overbeck, Correll, & Park, 2005). Group members who are seeking to advance their careers may not view performing behind-the-scenes, low-visibility tasks that facilitate group coordination as being in their best personal interests.

The failure of the heavily favored 2004 US men's Olympic basketball team to capture the gold medal represents a classic example of the perils of not having any individuals able and willing to integrate the contributions of others to facilitate the performance of the group. This team consisted of some of the best individual basketball talent in the world, including former National Basketball Association Most Valuable Players Tim Duncan and Allen Iverson and emerging stars like LeBron James and Carmelo Anthony. Unfortunately, team members were selected for their ability to shoot the basketball and score points rather than their willingness to play defense or pass the ball to open teammates (Wise, 2004). The results were shocking: in its first game, the heavily favored US team lost to Puerto Rico by 22 points. Kerr said that in basketball, "scoring baskets … [is] more readily observable than feeding [passing the ball to] open teammates" (p. 780). However, without a team member willing to integrate individual contributions to the group effort, the United States finished the tournament in a disappointing third place.

The willingness of individuals to integrate and coordinate the diverse contributions and perspectives of other group members is equally valuable in facilitating creativity in groups. Consider the example of ideational creativity in groups. A long line of research on brainstorming has sought to understand why groups suffer process losses relative to a comparable number of individuals working alone in generating ideas (for reviews, see Diehl & Stroebe, 1987; Litchfield, 2008; Mullen, Johnson, & Salas, 1991). Alex Osborn (1957), who first developed brainstorming as an intervention, suggested that the true value of generating ideas in groups comes from opportunities to build on and integrate the ideas suggested by others. However, group members are often so focused on thinking up their own ideas while waiting to speak that they fail to listen to and build on the ideas of others (Diehl & Stroebe, 1991). Without an individual who seeks opportunities to coordinate and build on the ideas of others, ideational groups are unlikely to realize their potential.

In this paper, we suggest that the performance of creative groups can be facilitated by an individual in the glue role. An individual enacts a glue role by seeking out and taking on coordinating tasks in the group that would otherwise be neglected. We begin by defining the glue role and distinguishing it from related constructs. We then examine how individuals craft and enact glue roles in creative groups. Finally, we discuss the potential effects of an individual in the glue role on the performance of creative groups.

DEFINING THE GLUE ROLE

An individual enacts a glue role by seeking out and taking on tasks that would otherwise be neglected but which have the potential to facilitate group effectiveness. Our definition of the glue role highlights two key points. On the one hand, the glue role is contextually defined. It is an adaptive individual behavior and reactive in the sense that it arises in response to the specific needs of the group. On the other hand, an individual enacts the glue role by actively seeking out opportunities to coordinate the efforts of the group. This individual is likely to be especially sensitive to the coordinating needs of the group and attentive to gaps in the group's process – neglected tasks that, although not essential to group functioning, have the potential to facilitate a creative group's effectiveness through coordinating group members' contributions.

An individual in the glue role engages in behaviors that are valuable to creative groups but which do not receive much attention or recognition. The need for an individual to adopt the glue role arises because creative tasks require group members to engage in a variety of activities, some of which are more vivid – that is, visible and easily identifiable (Nisbett & Ross, 1980) – than others. The most vivid behaviors in idea-generating groups, for example, involve coming up with novel, original ideas. As Sutton and Hargadon (1996) observed in their in-depth study of product design firm IDEO, modified brainstorming (i.e., "deep dive") sessions serve as "status auctions," in which individuals who come up with creative ideas gain status in the organization and prestige in the eyes of their colleagues. However, if group members focus exclusively on generating their own ideas and fail to build on the ideas of others, they miss out on what Osborn (1957) believed to be the true value of working together in a group. Group members may fail to attend to the ideas of others, however, because building on the ideas of others is less vivid than coming up with a creative idea. As a result, an individual willing to build on and integrate the ideas of others can facilitate creativity in ideational groups.

In defining the glue role, we also seek to delimit the boundaries of the construct and our discussion of it. The concept of the glue role draws on and incorporates elements from a number of conceptual traditions in the study of behavior in groups. Although the glue role builds on other concepts, it describes a construct that captures a phenomenon that is distinct. We have also chosen to discuss the glue role in terms of the interactive phases of groups in which creative work is being accomplished. Although we acknowledge that many creative groups are also responsible for implementing the ideas that they generate – and that an individual in the glue role has the potential for facilitating group performance outside of creative interactive phases – the current discussion is confined to examining the glue role during the creative interaction phases of groups.

The glue role is related to concepts such as organizational citizenship behaviors (OCBs), which describe employee efforts that go beyond the boundaries of formal role requirements to help other group members in completing their tasks (Bateman & Organ, 1983; Organ, 1988). The behaviors associated with the glue role are similar to some OCBs to the extent that both types of behavior help others in groups. However, the glue role is distinct from OCBs in two ways. First, by definition, a role involves engaging in integrating behaviors repeatedly over time. Different members might engage in helping behaviors that integrate the activities of the group at different times, but we suggest that an individual enacts the glue role only by taking on the same "glue" activities repeatedly. Second, whereas OCBs can refer to any one-on-one helping behaviors which may or may not directly facilitate the efforts of the group, the glue role consists of a more specific set of tasks that enable the coordination and integration of the diverse contributions of multiple group members.

The glue role is also related to theories of leadership that emphasize the influence of group members beyond the group's formal leader. The constructs of shared (Carson, Tesluk, & Marrone, 2007), emergent (Schneier & Goktepe, 1983), and functional (Adair, 1983) leadership all reflect dissatisfaction with traditional views of leadership as something that inheres in a single individual with formal authority. They are similar to the construct of the glue role in the sense that they seek to shift the focus away from the characteristics and behaviors of a group's formal leader to the activities of other members of the group. However, the activities of an individual in the glue role transcend leadership because an individual can facilitate group creativity without engaging in attempts to influence the motives or actions (Yukl, 1989) of others. An individual in the glue role coordinates and integrates the efforts of others, but these activities may not necessarily be the best route toward exerting influence over others.

Finally, the glue role is related to but distinct from the construct of social roles (Eagly, 1987; Slater, 1955). According to Bales (1970), social roles involve behaviors focused specifically on maintaining the cohesion and solidarity of a group. A social role is distinct from a task role in that the behaviors in which an individual in a social role engages do not contribute directly to completing the group's task. Examples of social role behaviors might include verbally encouraging others, stepping in to mediate interpersonal conflicts, and otherwise seeking to help satisfy the emotional needs of other group members (Gladstein, 1984). As we will later argue, a glue role may have many of the same effects as a social role in that the willingness of an individual to adopt a glue role may enable intragroup trust (Jones & George, 1998) that facilitates conflict management. However, an individual in a glue role facilitates these effects by engaging in activities that directly contribute toward accomplishing the group's task. As a result, an individual who crafts a glue role engages in activities consistent with a task role, yet these activities may have many of the same effects that researchers have theorized should result from the adoption of social roles.

HOW INDIVIDUALS CRAFT AND ENACT THE GLUE ROLE

So far we have defined the glue role, provided examples of how it manifests in the context of creative groups, and described its relationship to other constructs. In this section, we draw on the negotiated order perspective (Strauss, 1978) as a means of better understanding how the glue role is crafted and enacted by individuals in creative groups. The negotiated order perspective on roles suggests that roles are negotiated in and through interaction and in relation to the constraining and enabling effects of social structures (Bechky, 2006). The negotiated order perspective draws our attention to the ways in which individual activities are constrained (and enabled) by social structures such as small groups.

The negotiated order perspective has often been applied in the context of organizations with hierarchical structures and relatively rigid role definitions (Stelling & Bucher, 1972), but our interest in group creativity brings the negotiated order perspective into a more emergent structural environment.

Groups engaged in creative tasks frequently operate in an emergent social context characterized by a dynamic structure created in and through ongoing interaction (Sawyer, 2003). The negotiated order perspective of roles provides a mechanism for accounting for the ways in which the structure of a collective is constrained and enabled as well as reenacted (reproduced and altered) in and through these interactions (Bechky, 2006; Strauss, 1978).

From a negotiated order perspective, individual agency and emergent social structure are mutual influences in the development of roles in groups. We view the construction of roles as neither a function of the person or the situation alone, because individuals are neither completely autonomous in their ability to construct roles in groups nor completely constrained by the social structures they encounter. Instead, our purpose is to theorize how individuals seek out and craft roles in the windows of opportunity enabled by the emerging structure of the groups in which they participate. In this section, we will provide two examples of how a creative group's emerging social structure can constrain individual activity while simultaneously providing windows of opportunity for an individual to take on the glue role. In our first example, the social structure that emerges is a function of the configuration of group members' personalities. In our second example, the social structure is a function of the emerging interdependence of the creative task.

Group Composition

The composition of a group is one element of an emerging social structure that might constrain the agency of individuals in crafting roles in creative groups. One element of group composition is the configuration of personalities in a group, which is likely to influence a group's emerging structure through its influence on social and interaction dynamics (Moynihan & Peterson, 2001). For example, Barry and Stewart (1997) conducted an experimental study of self-managed groups engaged in an open-ended, creative problem-solving task to examine the influence of the configuration of group members' personalities on group performance. They found a curvilinear effect in relation to extroversion. Groups with a moderate number of extroverts performed best, whereas group performance tended to suffer in groups with a high proportion of extroverts. According to the authors, a lack of task focus was the underlying mechanism driving the poor performance of groups with a high proportion of extroverts. Perhaps those groups lost sight of the task at hand as group members focused on saying their ideas out loud and neglected to integrate and build on the ideas that had already been suggested.

In Barry and Stewart's study, there were no rules dictating that every group member needed to speak their ideas, nor was a reward structure in place that would reward individual contributions to solving the problem. As a result, the social and interactional dynamics that ultimately hindered group creativity emerged from the configuration of group members' personalities. Furthermore, the high proportion of extroverts in this example constrained the development of certain roles. There would be little use in a group with a high proportion of extroverts for yet another group member who would try to dominate the conversation.

However, this emerging context would also provide an opportunity for an individual to contribute to group effectiveness by adopting a complementary glue role (Muchinsky & Monahan, 1987). In groups with a high proportion of extroverts, many members are eager to contribute ideas, but there may be no one to listen to and integrate the ideas being suggested. Such situations create a window of opportunity for an individual who is sensitive to the integrating needs of the group to assume a glue role.

What are the characteristics of individuals who choose to seek out and enact otherwise neglected coordinating and integrating tasks rather than engaging in other, more vivid behaviors? Put another way, what leads some group members to focus on the integration and coordination needs of the collective rather than behaviors that would seem to benefit them as individuals? A full account of the possible attributes characterizing individuals in the glue role is beyond the scope of this project; however, we suggest that individuals who enact the glue role can be driven by a desire to facilitate both collective and individual outcomes. Consider an individual who takes on a glue role in an idea-generating group. This individual's integrating activities, which are intended to facilitate group effectiveness, may appear to some as an exercise in irrational self-denial – taking one for the team, as it were. However, if the organization's compensation is at least partially based on group outcomes, the individual in the glue role also stands to benefit personally from the group's success. We will return to the issue later in discussing the implications of compensation systems on the potential for "glue" activity in groups.

Task Interdependence

In addition to group composition, the structure of a creative group's task can also influence its emergent social structure. One facet of task structure is level of interdependence, the degree to which the task requires that multiple individuals work together (Wageman, 2001). Interdependence has often been conceptualized as a property of the group's task, a structure that is imposed on the group by management or other external forces (Thompson, 1967). However, work by Wageman and Gordon (2005) suggests that interdependence can also emerge as a function of group members' values and preferences. The latter view of interdependence is especially valuable to understanding the dynamic nature of many creative groups, in which structure emerges as group members interact over time (Sawyer, 2003).

Academic research groups are an example of creative groups in which group members' preferences may dictate the interdependence of the task. Suppose that a group of four researchers decide to work together on a research project. The task could be completed in different ways with varying levels of interdependence. The group could choose to structure the task with a high degree of interdependence by having all four participants meet together each day and sit around the computer to write the paper together. Alternately, the group could choose to structure the task by dividing the paper into four sections, having each group member write one section of the paper, and then meeting to combine the sections into a single paper at a later time. A third method for structuring the task would be to have the lead author write a first draft and then circulate that draft to each of the other three group members, who take turns providing their comments and feedback.

The integrating behaviors associated with the glue role may also look different, depending on the degree of interdependence embedded in the academic research group's task structure. In the most highly interdependent task structure, where all four members sit down at the computer each day to jointly compose the paper, the glue role may be adopted by the individual who interprets and paraphrases other members' ideas and who assures that every person's views are heard. If the group opts to divide the paper into sections and then combine each individual's section into a final paper at a later time, an individual may take on the glue role by taking the time to write transition paragraphs between sections that improve the paper's flow to make it sound like it was written by one person instead of four. If the group chooses to have the lead author write a draft of the paper and then circulate the draft to each of the other group members for comments, an individual may take on a glue role by clarifying the issues underlying differences in opinion and making suggestions about how conflicting suggestions for revising the paper can be reconciled. In each case, individuals who take on the glue role adapt their behaviors to the specific needs of the group that flow from the degree of task interdependence and emerge from the preferences of a creative group's members.

Negotiating Other Group Members' Perceptions

As the metaphor of a negotiated order implies, an individual not only acts to craft the glue role in relation to an emerging social context, but also in relation to other group members who are actively perceiving and reacting to the activities of that individual. From a negotiated order perspective, group members' perceptions of the actions of an individual in the glue role are embedded in broader macrosocial norms and assumptions about what motives govern others' behavior (Svensson, 1996). Self-interest, for example, is widely viewed as a cardinal motive for human behavior (Miller, 1999; Schwartz, 1986). By engaging in behaviors that enable the coordination of a creative group at the expense of behaviors that might facilitate recognition of individual achievement, an individual in a glue role might appear to others to be acting for reasons other than self-interest. Drawing on work by Saparito, Chen, and Sapienza (2004), we suggest that the ways in which individuals in the glue role represent their motives to other group members have implications for the negotiation of the glue role and the development of trust.

Saparito and his colleagues suggest that self-interest is often the default motive attributed to other parties. This assumption of self-interest arises both from macrosocial, collectively shared cultural ideologies (Miller & Ratner, 1996), and from more local contextual assumptions, such as expectations that business relationships are instrumental and both parties will act in their rational self-interest (Petersen & Rajan, 1994). The macrosocial norm of self-interest is supported in creative groups by the widespread view of creativity as an individual phenomenon (Paulus & Nijstad, 2003) and reinforced by selection practices that emphasize specialized skills and knowledge rather than group members' ability to work well together (Marks et al., 2002). However, it should also be noted that group members' perceptions of task interdependence – which typically follow more interdependent structural arrangements (Wageman, 2001) – should moderate the degree of self-interest in the group. Specifically, groups whose members perceive their tasks as more interdependent may have weaker norms of self-interest, at least within the context of that group.

When called to account for their behaviors in the course of ongoing interactions with other group members, individuals enacting the glue role may gain credibility by framing their motives in terms that are congruent with the macrosocial norm of self-interest. For example, an individual taking assiduous notes in committee meetings may frame his actions in terms of having a poor memory and needing to take careful notes to remember what was said for his portion of the committee's final report. By representing their actions in terms consistent with the norm of self-interest, individuals in the glue role provide an account that is likely to be congruent with other group members' expectations of what motivates rational behavior. This perceived congruence is likely to facilitate initial trust that, over time, may develop into a deeper level of trust built on a sense of common fate and shared values (Jones & George, 1998; Lewicki & Bunker, 1996).

Drawing on the negotiated order perspective on the development of roles offers insight into the dynamic interplay between the structural context of a social setting and the individual's ability to seek out, craft, and enact a glue role in a creative group. It introduces a framework for a more balanced examination of the mutual influence of individual agency and emergent social structure on one another as well as a mechanism for linking the negotiation of individual behaviors to broader macrosocial norms. We have presented an account of the glue role in creative groups as a situated phenomenon, negotiated in relation to a particular emergent social structure, responsive to other group members' perceptions, and embedded in macrosocial norms and assumptions. In the next section, we consider how an individual's willingness to enact a glue role may facilitate creative group effectiveness.

THE EFFECTS OF THE GLUE ROLE

So far, we have defined the glue role, provided examples of its manifestation in a variety of creative group contexts, and discussed its relationship to related constructs. We have also examined how individuals seek out and craft glue roles by capitalizing on windows of opportunity that are enabled by the social structures that emerge in creative groups over time. We will now articulate and discuss potential mechanisms through which the willingness and ability of an individual to seek out and enact the glue role can facilitate the effectiveness of groups engaged in creative tasks. We suggest that the glue role is likely to facilitate group effectiveness through its influence on coordination and conflict management.

The Glue Role and Coordination

Coordination in work groups involves aligning and integrating the activities and objectives of group members toward a common collective goal

(Arrow, McGrath, & Berdahl, 2000). Coordination is viewed as a critical process in facilitating group success, particularly the success of groups engaged in creative tasks (Brophy, 1998). Without adequate coordination, a group risks process losses (Steiner, 1972) that waste group members' efforts and other resources while jeopardizing the group's ability to meet its goals. Researchers have suggested that coordination can occur in groups through explicit coordination, in the form of intentional planning and programming (March & Simon, 1958), or through interpersonal communication (Van de Ven et al., 1976). Recently, researchers have pointed out that much of the coordination that occurs in groups is implicit, whereby group members adjust their behavior in relation to the behaviors of others in the group without formally communicating or planning in advance (Rico, Sanchez-Manzanares, Gil, & Gibson, 2008). Shared mental models (Klimoski & Mohammed, 1994), trust (Jones & George, 1998), habitual routines (Gersick & Hackman, 1990), and teamwork knowledge (Marks et al., 2002) are just a few of the proposed mechanisms through which group members are thought to implicitly coordinate their efforts.

The centrality of coordination to the effectiveness of creative groups is especially visible in idea-generating groups. Researchers have found that face-to-face groups working together typically generate fewer ideas than nominal groups, in which individuals generate ideas on their own and later combine them (Diehl & Stroebe, 1987; McGrath, 1984; Taylor, Berry, & Block, 1958). That is, brainstorming groups that interact with one another perform at a deficit relative to those that do not. Diehl and Stroebe (1991) suggest that a primary source of process losses in ideational groups results from deficits in coordination. Specifically, Diehl and Stroebe identify production blocking, whereby group members are so focused on trying to generate their own ideas while waiting for their turn to speak that they miss out on opportunities to build on existing ideas suggested by other group members. To the extent that groups can coordinate the diverse contributions of multiple members to build on suggested ideas rather than generating each new idea from scratch, they should be able to generate a higher quantity and quality of ideas and engage in a more efficient process.

Although it could be useful for a group engaged in a creative task to coordinate its efforts through distributed mechanisms like generic group member teamwork skills (Ellis et al., 2005), the reality is that these forms of coordination may not always work well for creative groups. As a result, members of these types of groups are often selected primarily for their specialized knowledge and abilities rather than for their skill at working well in a group (Marks et al., 2002). The result is that members may be very good at what they do individually but, absent some other mechanism for coordinating each member's individual inputs, the group's performance as a collective suffers (Hollenbeck et al., 2004).

An alternative possibility for integrating creative group members' efforts is illustrated by the notion of coordination through roles (Bechky, 2006). A role is a set of behaviors that characterize a particular group member in a particular setting in relation to the activities of other group members (Biddle, 1979; Katz & Kahn, 1978). An individual who seeks out and enacts a glue role may facilitate group effectiveness by sensing what group-oriented coordinating tasks are being neglected and taking them on. This individual can become a focus point for coordinating the efforts of other group members, allowing other members to do what they do best. The technical analyst who helps the lead scientists in a research and development group by providing interpretation and support of an obscure statistical process frees the lead scientists to focus on their presentation to top management. The "assiduous note taker" enables the other members of the committee to focus on contributing ideas and debating issues. In both cases, the other members of the group have greater freedom to focus on their own contributions because the individual in the glue role repeatedly engages in integrating behaviors. Over time, group members come to recognize that the individual has adopted the glue role through consistently taking on tasks that coordinate their efforts and facilitate the group's performance. As other group members recognize the coordinating activities of the individual in the glue role over time, this results in the development of trust that facilitates group effectiveness.

Proposition 1. Individuals facilitate coordination in creative groups by enacting the glue role.

Proposition 2. The coordinating behaviors of individuals in the glue role facilitate the effectiveness of creative groups.

The Glue Role and Conflict Management

In addition to facilitating creative group performance through the coordination of diverse group members' efforts, an individual in the glue role can also facilitate group creativity through conflict management. Effective conflict management works parallel to coordination in that it has the potential to remove barriers to the integration of group members' efforts. In this section, we follow the distinction in the literature between conflict that is task based and relationship based (Guetzkow & Gyr, 1954; Pinkley, 1990; Jehn, 1995; Jehn & Mannix, 2001) and discuss how an individual in the glue role can facilitate conflict management that encourages a moderate level of task conflict but prevents task conflict from degenerating into relationship conflict.

Task conflict refers to differing viewpoints, ideas, and opinions related to the group's task, whereas relationship conflict refers to disagreements over interpersonal issues and other concerns not directly related to the task (Jehn, 1995, 1997; Jehn & Bendersky, 2003). Moderate levels of task conflict have been found to benefit group performance by encouraging discussion and debate that enables a better understanding of the issues at hand (Fiol, 1994; Janssen, Van de Vliert, & Veenstra, 1999) and provide group members the opportunity to voice their ideas and perspectives (Amason, 1996; Peterson, 1997). Relationship conflict, on the other hand, has been consistently associated with negative group outcomes (Gladstein, 1984; Jehn & Bendersky, 2003) that are driven, in part, by less information sharing and perceptions that other group members are not supportive (Shalley, Zhou, & Oldham, 2004).

Creative groups walk a tightrope in managing conflict. On the one hand, some degree of task conflict is likely to benefit group creativity because it encourages a more robust debate that involves hearing minority viewpoints and ideas, which should ultimately lead to better idea generation and more creative solutions (Nemeth & Nemeth-Brown, 2003; Nemeth, Personnaz, Personnaz, & Goncalo, 2004). On the other hand, high levels of task conflict can easily turn into relationship conflict, which has the potential to reduce information sharing and limit group members' cognitive functioning (Jehn & Mannix, 2001).

We suggest that an individual in the glue role can enable group creativity by (1) encouraging a moderate level of task conflict and (2) facilitating conflict management that prevents task conflict from escalating into relationship conflict. First, an individual in the glue role may engage in behaviors that encourage and integrate the contributions of every group member, including those whose voices may not otherwise be heard. Group members whose points of view are very different from the perspectives of the rest of the group can be valuable to creative groups by encouraging further discussion (Fiol, 1994) and by introducing unique frames of reference that spark creative insights for recombining existing ideas in a new way (Hargadon & Bechky, 2006). However, groups may fail to utilize the contributions of some group members by discounting certain members' expertise based on social role expectations (Thomas-Hunt & Phillips, 2004) or by over weighting the contributions of individuals who are extroverted (Bonner, 2000) or whose ideas are more consistent with the majority of group members' perspectives (Bonner, Gonzalez, & Sommer, 2004). An individual in the glue role can ensure that potentially marginalized ideas are heard by reminding group members that they have not heard from certain individuals for a while. An individual in the glue role can then return to minority ideas, paraphrase them, and link them in a way that interfaces with the group's discussion. For example, in an architectural design group charged with designing an environmentally sustainable housing complex, an individual in the glue role might say, "I remember that Tony said something about designing low-wattage light fixtures in his last job. Tony, do you mind telling us more about what you did before?"

Proposition 3. Individuals in the glue role facilitate group creativity by enabling the group to incorporate and capitalize on the diverse perspectives of multiple group members.

Second, an individual in a glue role can facilitate conflict management that prevents task conflict from evolving into relationship conflict through the development of intragroup trust. Managers are seeking ways to promote trust as a means for facilitating collective performance (Kramer & Tyler, 1996) and trust is especially important in groups that ask their members to take creative risks to come up with innovative solutions (Edmondson, 1999). The ability of an individual in the glue role to foster trust is valuable to conflict management because researchers have found that intragroup trust moderates the relationship between task and relationship conflict by preventing task conflict from turning into relationship conflict (Peterson & Behfar, 2003; Simons & Peterson, 2000).

Trust is negotiated in and through ongoing interactions among group members (Jones & George, 1998) and develops over time when individuals demonstrate consistent, trustworthy behaviors (Kelley, 1967). By consistently taking on tasks that integrate group members' efforts, an individual in the glue role demonstrates a commitment to facilitating the goals of the group. This demonstration of commitment to the group objective has the potential to foster broader intragroup trust over time that enables group members to give one another the benefit of the doubt in conflict situations (Zaheer, McEvily, & Perrone, 1998). Simons and Peterson (2000) find that task conflict can evolve into relationship conflict through a process of misattribution, whereby individuals make antagonistic or sinister attributions for other group members' behavior. The presence of intragroup trust can prevent task conflict from escalating into relationship conflict by increasing the likelihood that group members will attribute conflict to a simple misunderstanding (Jehn & Mannix, 2001) or to other group members' sincere desire to push for a more creative product or performance. By taking the initiative to act consistently in terms of group-focused objectives, individuals in the glue role can enable trust built on shared values and interests (Lewicki & Bunker, 1996) that facilitates group conflict management.

Proposition 4. Individuals in the glue role should enable conflict management through the facilitation of intragroup trust.

DISCUSSION AND FUTURE DIRECTIONS

Creative groups have the potential to benefit from the unique insights and contributions of specialists with different skills and expertise. As researchers, we still have much to learn about how creative groups can effectively integrate specialists' diverse efforts into a single creative performance or product. Understanding how specialist contributions are integrated is especially difficult in cognitive tasks in which there is little visible evidence of the coordination of diverse efforts. In examining the glue role, we hope to shed light on a mechanism through which diverse efforts are integrated in creative groups.

In this paper, we offer three primary contributions to research on group creativity. First, we introduce and define the concept of the glue role as an example of how individuals can enact specific roles to influence group performance (Stewart et al., 2005). This addresses a call that researchers more carefully consider how individuals impact group effectiveness through characteristic behaviors and the adoption of roles (Levine & Moreland, 1990).

Second, this research applies the negotiated order perspective on roles to examine how individuals can craft and enact specific roles in creative groups, embedded in dynamic social contexts, whose task structures are emergent rather than externally imposed. This perspective provides an account of the interplay between a group's emerging social structure in conjunction with the activities of individual group members. The negotiated order perspective also offers a process-based account of individual role crafting as a situated and negotiated phenomenon in the context of creative groups.

Finally, this project suggests a different approach to facilitating the effectiveness of creative groups, of which ideational groups are an example. Beginning with Osborn (1957), researchers have examined brainstorming as an intervention for reducing process losses and enabling productivity gains in idea-generating groups. Brainstorming is an example of a group-level, instruction-based intervention – that is, every member of the group receives the same written and verbal instructions. The glue role, however, suggests a possible intervention that is different in kind from brainstorming. Managers could assign an individual to the glue role in an idea-generating group by instructing only that individual to seek out opportunities to build on and integrate the ideas of others. Such individuals would not be responsible for coming up with new ideas from scratch; rather, they would be evaluated only on the degree to which they facilitated the group's ability to integrate the contributions of multiple members by building on the ideas of others.

Examining the glue role as an individual-level, role-based intervention for facilitating group creativity is an important direction for future research that would enable researchers to examine the nature and properties of the glue role in a more concrete way. Experimentally assigning individuals to the glue role in both lab and field studies should enable researchers to explore the potential efficacy of the glue role as an intervention for creative groups. It would also provide further insight into the degree to which potential moderating variables, such as individual differences in characteristics, may affect the effectiveness of an individual in the glue role. Ideally, this research would initially be grounded in a specific creative context, such as ideational groups, and then expanded to examine other types of creative groups.

Research on the glue role may also offer insights into strategies for compensation practices that facilitate the performance of creative groups. Although organizations often pay lip service to the importance of teamwork in groups, they frequently compensate individual performance by using metrics that only end up measuring individual performance (Fletcher, 1999). Wageman (1995) found that this type of compensation system – offering independent (i.e., individually-based) rewards to groups engaged structurally interdependent tasks – undermines teamwork and diminishes group effectiveness. Even more damaging, a compensation system that only rewards individuals who engage in behaviors more vivid than integrating and coordinating the contributions of group members may discourage individuals from taking on the glue role. To the extent that an individual in the glue role can facilitate group creativity, poorly designed compensation systems that discourage "glue" behaviors may create yet another barrier to creative group effectiveness.

Finally, future research should also examine the extent to which the benefits associated with the glue role may extend beyond the context of creative groups. In fact, we would suggest that an individual in the glue role can emerge and potentially benefit almost any group in which (a) group members are selected primarily for their skills and expertise; (b) coordinating and integrating activities have the potential to facilitate group effectiveness; and (c) certain activities and behaviors in the group are more vivid and likely to be rewarded than others, leading to the neglect of other, less vivid activities. As Kerr (1975) argued, many groups and organizations in contexts ranging from business to the military, to sports, and to politics, fail to perform to their potential because members attend to vivid, individual activities and fail to engage in activities that would integrate the contributions of others and enable the group to work well together.

It is our sincere desire that this line of research will encourage further examination of how individuals adopt roles in creative groups and how those roles can influence group creativity. Researchers know a good deal about both the formal and informal roles of leadership, but relatively little about the enactment of other roles in small groups (Levine & Moreland, 1990). We hope that this project will facilitate further inquiry into the individual activities that can influence group creativity.

REFERENCES

Adair, J. (1983). *Effective leadership*. Aldershot, England: Gower.

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.

Amason, A. C. (1996). Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy of Management Journal*, *39*, 123–148.

Arrow, H., McGrath, J. E., & Berdahl, J. L. (2000). *Small groups as complex systems: Formation, coordination, development, and adaptation*. Thousand Oaks, CA: Sage.

Bales, R. F. (1970). *Personality and interpersonal behavior*. New York: Holt, Rinehart, & Winston.

Barry, B., & Stewart, G. L. (1997). Composition, process, and performance in self-managed groups: The role of personality. *Journal of Applied Psychology*, *82*, 62–78.

Bateman, T. S., & Organ, D. W. (1983). Job satisfaction and the good soldier: The relationship between affect and employee citizenship. *Academy of Management Journal*, *26*, 587–595.

Bechky, B. A. (2006). Gaffers, gofers, and grips: Role-based coordination in temporary organizations. *Organization Science*, *17*, 3–21.

Biddle, B. J. (1979). *Role theory: Expectations, identities, and behaviors*. New York: Academic Press.

Bonner, B. L. (2000). The effects of member extroversion on influence in judgmental social tasks. *Small Group Research*, *31*, 225–244.

Bonner, B. L., Gonzalez, C., & Sommer, D. (2004). Centrality and accuracy in group quantity estimation. *Group Dynamics: Theory, Research, and Practice*, *8*, 155–165.

Brophy, D. R. (1998). Understanding, measuring, and enhancing collective creative problem-solving efforts. *Creativity Research Journal*, *11*, 199–229.

Carson, J. B., Tesluk, P. E., & Marrone, J. A. (2007). Shared leadership in teams: An investigation of antecedent conditions and performance. *Academy of Management Journal*, *50*, 1217–1234.

Conot, R. (1979). *A streak of luck*. New York: Seaview Books.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*, 497–509.

Diehl, M., & Stroebe, W. (1991). Productivity loss in idea-generating groups: Tracking down the blocking effect. *Journal of Personality and Social Psychology*, *61*, 392–403.

Eagly, A. H. (1987). *Sex differences in social behavior: A social-role interpretation*. Hillsdale, NJ: Erlbaum.

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*, 350–383.

Ellis, A. P. J., Bell, B. S., Ployhart, R. E., Hollenbeck, J. R., & Ilgen, D. R. (2005). An evaluation of generic teamwork skills training with action teams: Effects on cognitive and skill-based outcomes. *Personnel Psychology*, *58*, 641–672.

Fiol, C. M. (1994). Consensus, diversity, and learning in organizations. *Organization Science*, *5*, 403–420.

Fletcher, J. K. (1999). *Disappearing acts: Gender, power, and relational practice at work*. Cambridge, MA: MIT Press.

Gersick, C. J., & Hackman, R. J. (1990). Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes*, *47*, 65–97.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly*, *29*, 499–517.

Guetzkow, H., & Gyr, J. (1954). An analysis of conflict in decision-making groups. *Human Relations*, *7*, 367–381.

Hargadon, A. H., & Bechky, B. A. (2006). When collections of creatives become creative collectives: A field study of problem solving at work. *Organization Science*, *17*, 484–500.

Hollenbeck, J. R., DeRue, D. S., & Guzzo, R. (2004). Bridging the gap between I/O research and HR practice: Improving team composition, team training, and team task design. *Human Resource Management*, *43*, 353–366.

Janssen, O., Van de Vliert, E., & Veenstra, C. (1999). How task and person conflict shape the role of positive interdependence in management teams. *Journal of Management*, *25*, 117–142.

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly*, *40*, 256–282.

Jehn, K. A. (1997). A qualitative analysis of conflict types and dimensions in organizational groups. *Administrative Science Quarterly*, *42*, 530–557.

Jehn, K. A., & Bendersky, C. (2003). Intragroup conflict in organizations: A contingency perspective on the conflict-outcome relationship. *Research in Organizational Behavior*, *25*, 187–242.

Jehn, K. A., & Mannix, E. A. (2001). The dynamic nature of conflict: A longitudinal study of intragroup conflict and group performance. *Academy of Management Journal*, *44*, 238–251.

Jones, G. R., & George, J. M. (1998). The experience and evolution of trust: Implications for cooperation and teamwork. *Academy of Management Review*, *23*, 531–546.

Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations* (2nd ed.). New York: Wiley.

Kelley, H. H. (1967). Attribution theory in social psychology. In: D. Levine (Ed.), *Nebraska symposium on motivation* (pp. 192–238). Lincoln, NE: University of Nebraska Press.

Kerr, S. (1975). On the folly of rewarding A, while hoping for B. *Academy of Management Journal*, *18*, 769–783.

Klimoski, R. J., & Mohammed, S. (1994). Team mental model: Construct or metaphor. *Journal of Management*, *20*, 403–437.

Kramer, R. M., & Tyler, T. R. (1996). *Trust in organizations: Frontiers of theory and research*. Thousand Oaks, CA: Sage.

Levine, J. M., & Moreland, R. L. (1990). Progress in small group research. *Annual Review of Psychology*, *41*, 585–634.

Lewicki, R. J., & Bunker, B. B. (1996). Developing and maintaining trust in work relationships. In: R. M. Kramer & T. R. Tyler (Eds), *Trust in organizations: Frontiers of theory and research* (pp. 114–139). Thousand Oaks, CA: Sage.

Litchfield, R. C. (2008). Brainstorming reconsidered: A goal-based view. *Academy of Management Review*, *33*, 649–668.

March, J., & Simon, H. (1958). *Organizations*. New York: Wiley.

Marks, M. A., Sabella, M. J., Burke, C. S., & Zaccaro, S. J. (2002). The impact of cross-training on team effectiveness. *Journal of Applied Psychology*, *87*, 3–13.

McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.

Miller, D. T. (1999). The norm of self-interest. *American Psychologist*, *54*, 1–8.

Miller, D. T., & Ratner, R. K. (1996). The power of the myth of self-interest. In: L. Montada & M. J. Lerner (Eds), *Current societal issues about justice* (pp. 25–48). New York: Putnam.

Milliken, F. J., Bartel, C. A., & Kurtzberg, T. R. (2003). Diversity and creativity in work groups. In: P. B. Paulus & B. A. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 32–62). Oxford: Oxford University Press.

Moynihan, L. M., & Peterson, R. S. (2001). A contingent configuration approach to understanding the role of personality in organizational groups. *Research in Organizational Behavior*, *23*, 327–378.

Muchinsky, P. M., & Monahan, C. J. (1987). What is person-environment congruence? Supplementary versus complementary models of fit. *Journal of Vocational Behavior*, *31*, 268–277.

Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology*, *12*, 3–23.

Nemeth, C. J., & Nemeth-Brown, B. (2003). Better than individuals? The potential benefits of dissent and diversity for group creativity. In: P. Paulus & B. Nijstad (Eds), *Group creativity: Innovation through collaboration* (pp. 63–84). Oxford: Oxford University Press.

Nemeth, C. J., Personnaz, B., Personnaz, M., & Goncalo, J. A. (2004). The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology*, *34*, 365–374.

Nisbett, R. E., & Ross, L. (1980). Assigning weights to data: The "vividness criterion". In: R. E. Nisbett & L. Ross (Eds), *Human inference: Strategies and shortcomings of social judgment* (pp. 42–62). Englewood Cliffs, NJ: Prentice-Hall.

Organ, D. W. (1988). *Organizational citizenship behavior – The good soldier syndrome*. Lexington, MA: D. C. Heath and Co.

Osborn, A. F. (1957). *Applied imagination* (1st ed.). New York: Scribner's.

Overbeck, J. R., Correll, J. C., & Park, B. (2005). The internal sorting process of group status: The problem of too many stars. In: M. Thomas-Hunt, E. Mannix & M. A. Neale (Eds), *Research on managing groups & teams* (Vol. 7, pp. 169–199). St. Louis, MO: Elsevier Press.

Paulus, P. B., & Nijstad, B. A. (2003). *Group creativity: Innovation through collaboration*. Oxford: Oxford University Press.

Petersen, M. A., & Rajan, R. G. (1994). The benefits of lending relationships: Evidence from small business data. *Journal of Finance*, *49*, 3–37.

Peterson, R. S. (1997). A directive leadership style in group decision making can be both virtue and vice: Evidence from elite and experimental groups. *Journal of Personality and Social Psychology*, *72*, 1107–1121.

Peterson, R. S., & Behfar, K. J. (2003). The dynamic relationship between performance feedback, trust, and conflict in groups: A longitudinal study. *Organizational Behavior and Human Decision Processes*, *99*, 143–160.

Pinkley, R. L. (1990). Dimensions of conflict frame: Disputant interpretations of conflict. *Journal of Applied Psychology*, *75*, 117–126.

Rico, R., Sanchez-Manzanares, M., Gil, F., & Gibson, C. (2008). Team implicit coordination processes: A team knowledge-based approach. *Academy of Management Review*, *33*, 163–184.

Saparito, P. A., Chen, C. C., & Sapienza, H. J. (2004). The role of relational trust in bank-small firm relationships. *Academy of Management Journal*, *47*, 400–410.

Sawyer, R. K. (2003). *Group creativity*. Mahweh, NJ: Lawrence Erlbaum.

Schneier, C. E., & Goktepe, J. R. (1983). Issues in emergent leadership: The contingency model of leadership, leader sex, and leader behavior. In: H. H. Blumberg, A. P. Hare, V. Kent & M. F. Davies (Eds), *Small groups and social interaction*. Chichester, UK: Wiley.

Schwartz, B. (1986). *The battle for human nature*. New York: Norton.

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, *6*, 230–245.

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal roles of intragroup trust. *Journal of Applied Psychology*, *85*, 102–111.

Slater, P. E. (1955). Role differentiation in small groups. *American Sociological Review*, *20*, 300–310.

Smith, K. K., & Berg, D. N. (1987). *Paradoxes of group life: Understanding conflict, paralysis, and movement in group dynamics*. San Francisco, CA: Jossey-Bass.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.

Stelling, J., & Bucher, R. (1972). Autonomy and monitoring on hospital wards. *Sociological Quarterly*, *13*, 431–446.

Stewart, G. L., Fulmer, I. S., & Barrick, M. R. (2005). An exploration of member roles as a multilevel linking mechanism for individual traits and team outcomes. *Personnel Psychology*, *58*, 343–365.

Strauss, A. (1978). *Negotiations: Varieties, contexts, processes, and social order*. San Francisco, CA: Jossey-Bass.

Sutton, R. I., & Hargadon, A. H. (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, *41*, 685–718.

Svensson, R. (1996). The interplay between doctors and nurses – A negotiated order perspective. *Sociology of Health and Illness*, *18*, 379–398.

Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, *45*, 315–331.

Taylor, D. W., Berry, P. C., & Block, C. H. (1958). Does group participation when using brainstorming facilitate or inhibit creative thinking? *Administrative Science Quarterly*, *3*, 23–47.

Thomas-Hunt, M. C., & Phillips, K. W. (2004). When what you know is not enough: Expertise and gender dynamics in task groups. *Personality and Social Psychology Bulletin*, *30*, 1585–1598.

Thompson, J. D. (1967). *Organizations in action*. New York: McGraw-Hill.

Tyre, M. J., & Orlikowski, W. J. (1994). Windows of opportunity: Temporal patterns of technological adaptation in organizations. *Organization Science*, *5*, 98–118.

Van de Ven, A. H., Delbecq, L. A., & Koenig, R. J. (1976). Determinants of coordination modes within organizations. *American Sociological Review*, *41*, 322–338.

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly*, *40*, 145–180.

Wageman, R. (2001). The meaning of interdependence. In: M. E. Turner (Ed.), *Groups at work: Theory and research* (pp. 197–217). Mahwah, NJ: Erlbaum.

Wageman, R., & Gordon, F. M. (2005). As the twig is bent: How group values shape emergent task interdependence in groups. *Organization Science*, *16*, 687–700.

Wise, M. (2004). We got no game: Poor fundamentals cost Americans a shot at the gold. *Washington Post*, page A1.

Yukl, G. A. (1989). *Leadership in organizations*. Englewood Cliffs, NJ: Prentice Hall.

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*, 141–159.

HOW RELATIONAL PROCESSES SUPPORT TEAM CREATIVITY

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ABSTRACT

Teams should be hotbeds of creativity, yet they may naturally experience many barriers that thwart their ability to generate and select the most creative ideas. We propose that team relational support – a relational process involving the exchange of help, information, advice, and emotional concern – can help teams overcome the barriers that undermine team creativity. The following chapter proposes a process model of relational support and team creativity – identifying the mechanisms through which team relational support aids team creative processes.

Although companies increasingly rely on team structures to fuel creativity (Lovelace, Shapiro, & Weingart, 2001), research has primarily explored creativity as an individual level phenomenon (Kurtzberg & Amabile, 2001). This emphasis places relatively little focus on the relational processes that may be particularly important in team contexts where creative ideas are developed collectively and over time through social interaction with teammates. People have suggested that the interpersonal relationships in teams contribute to creativity (Elsbach & Kramer, 2003; Woodman, Sawyer, & Griffin, 1993), but how and why they affect creativity remains unclear, and so there is an opportunity to clarify these relationships.

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This would be useful because we often have conflicting theories as to the role of these factors. For example, some argue strong ties diminish creativity (Brass & Krackhardt, 1999; Granovetter, 1973) while other research hypothesizes and finds positive linear relationship between work-group supports and creative performance (Amabile, Conti, Coon, Lazenby, & Herron, 1996).

The literature describing the relationship between interpersonal relationships and creativity holds mixed results – this is largely because the literature operationalizes interpersonal relationships is many different ways. To bring clarity we focus and define interpersonal relationships building from theory in social psychology and health. Specifically we focus on social support (often operationalized and conceptually defined as the perception a person holds about the functional resources provided by others in a person's network) at the team level arguing that this constitutes team relational support. Team relational support – the supportive exchange of information, helping, advice, and emotions between teammates – should be particularly important for supporting creativity relevant processes in teams. Creativity is fundamentally about the creation and selection of ideas (Campbell, 1960), and teams require the additional tasks of synthesis of different people's ideas as well as agreement as to their value for them to be creative *as a team*. This view departs from the creativity literature which has focused on "social support" as a perception individuals have about the social resources available in their environments that influence their "own" creativity. Team relational support is a property of the team – not any single individual on the team – that emerges from intense interaction and exchange of resources over time. We will argue that creativity is a difficult task both cognitively and emotionally, and so relational support can facilitate both processes.

A second contribution is to examine social support at the team level as a *relational* (as opposed to a *social*) process. We emphasize that teams are essentially *relational* contexts. Relational processes require a sense of commitment and obligation to the other person over time (Reis, Collins, & Berscheid, 2000). Most research on social processes examine discrete events (e.g., one time exchanges), and while this may be more relevant in the case of either the lone genius (Simonton, 2003) or creativity in lab contexts (Amabile, 1978) where task–person relationships are temporary. In organizations, team members exchange affect (Amabile, Barsade, Mueller, & Staw, 2005) and work interdependently, in some cases for years. Thus the relational aspect of team relational support is a central feature of creative work teams.

In sum, the current chapter contributes to the literature in three ways. First, we theorize about the ways that positive relational processes are uniquely geared to overcome the informational and emotional hurdles that teams who are trying to be creative face. Second by discussing emotional and informational processes together, it fills a needed gap in team literature, namely research that jointly considers the factors related to informational efficacy and emotional well being (see, e.g., Mannix & Neale, 2006). Third, this chapter discusses team relational support through a lens that considers how people maintain relationships over time, providing a view of social interaction that had a more valid correspondence to what people experience in teams. In describing the relational lens and using social support to illustrate it, we hope to spur researchers to think how other team variables might be recast through the relational lens. Overall, we hope this chapter spurs more empirical work on the relational properties of creative teams, and how these engage the various mechanisms that support team functioning.

BASIC CONSTRUCTS IN THE MODEL: TEAM RELATIONAL SUPPORT AND TEAM CREATIVE PROCESS

Team Relational Support

We first define what we mean by team relational support – a relational process occurring within teams. Subsequently, we describe how team relational support affects the processes that support team creativity. At its most general, the theory of social support identifies ‘‘who gives what to whom regarding which problems’’ (House, 1981, pp. 22). In the case of team relational support, teams give supportive functional resources to other teammates regarding the work. In terms of what people give or receive, House (1981) identified four broad classes of supportive processes including: informational support, instrumental support, appraisal support, and emotional support. More specifically, informational support relates to the informal exchange of information that can facilitate effective completion of the work (e.g., sending a coworker a clipping from a recent article relevant to her work, calling a coworker to casually chat about a workplace event), instrumental support involves actual helping behaviors (e.g., taking time out to help a colleague solve a problem), appraisal support includes sharing or expressing constructive criticism or advice regarding the quality of a person's work (e.g., a coworker advising an employee how to execute his task more efficiently) and emotional support involves the flow of emotional concern within the group (e.g., giving a coworker a hug when they have had a difficult day).

Social support also implies particular norms of reciprocity, depending upon the type of relationship (Cohen, Underwood, & Gottlieb, 2000). Equality matching relationships characterized by equal reciprocity (with appropriate delay) where people monitor one-another's contribution (Fiske, 1992) are the kind we expect to find in teams, as these are characteristic of same-status relationships in work contexts (Clark & Mills, 1993). In equality matching contexts, social support takes a considerable amount of effort to give and once received comes with the expectation of future reciprocation; that is, teammates are motivated to exchange support to sustain their relationships over time (Parris, 2003). For this reason, social support attempts are motivated to a large degree either by social obligation to return support previously given, or with the expectation that social support will be given in future.

While social support thusly defined could exist in one time episodes; to capture the relational perspective requires further qualification. First, relationship formation involves an exchange of affect and requires at least some degree of interdependence (Reis et al., 2000). In contrast, social interaction can occur in lieu of interdependence and mutuality. That is, social interactions can occur between complete strangers while interpersonal relationships, Reis and colleagues argue, require repeated interaction over time where partners exhibit strong mutual influence over one another.

Thus team relational support is not only about giving various types of personal resources to others in one time exchanges. Rather, team relational support is relational because it is about an expectation to give and receive support. Over time this expectation is more than just a norm, it is a balance of favors given and received. Since favor receivers tend to see the favor as more beneficial than the givers see it as costly, (Flynn, 1999), over time a positive debt of obligation builds on both sides.

Team Creative Processes

Creativity is most commonly defined as the production of novel and useful products, ideas, or services (Amabile, 1988). Before describing the precise ways that relational social support enhances creativity, we must specify what it is about team creativity that relational social support may augment.

This requires first shifting from examining output to examining process. That is, rather than focus on group outcomes or an individual's contribution to group outcomes (Pirola-Merlo & Mann, 2004; Taggar, 2002), such as measuring creativity as expert judges ratings for each group's solutions, ideas, or products (Taggar, 2002); the number of ideas mentioned by each team's supervisor (De Dreu, 2006), or group grades for projects requiring creativity (Polzer, Milton, & Swann, 2002), we argue that understand how relational social support affects team creativity, it is important to understand the team level processes creative teams use to get to the creative output.

Building on Campbell's (1960) evolutionary model of creativity, Simonton (1988) identifies that creativity involves the interplay between two processes, idea generation and idea selection. Both idea generation and selection are seen to enhance novelty and usefulness of a given outcome (product or process). Simonton argued that idea generation promotes novelty by increasing the sheer number of thought combinations as well as the uniqueness of the thought relative to the problem domain. In contrast idea selection occurs when the idea creator chooses one of the thought combinations that best meets the criterion for both novelty and usefulness. While novelty is a function of the variety of different ideational elements in the mind of a creator, usefulness is a function of the selection processes used to evaluate ideas. To select an idea, one will need to understand how it will be relevant, as well as what utility it provides. Selection processes ensue as idea creators test ideas against their particular usefulness or novelty criteria to then choose the best ideas. In this view, anything that increases the variation of thought and ability to select given ideas in the mind of the creator will thereby influence creativity. We wonder how these processes change at the group level.

In terms of idea generation in an individual, thoughts are primarily generated internally (i.e., retrieved from memory, or noticed and then assimilated), but in teams thoughts are also influenced by information exchange. Thus in a team, new ideas can come not only from what "pops into an individual's head," but also what other teammates direct each other's attention to. This is both an explicit and an implicit process. An individual on a team can focus attention on an aspect that others have not thought about, such as designers pointing out that computers do not need to look like ugly tan boxes, thus getting the team to think about improving the computer in a way that was novel (i.e., visually, rather than technologically). This explicit process happens via overt communication of ideas. At the same time, a person mentioning a new idea can also indirectly spur other related ideas to "pop in" to the heads of the others based on the underlying associations that individuals have. To continue with our example, imagine that a team is designing a computer and one teammate talks about styling – this may cause other teammates to think about color (yet others will think about a particular style or shape). The person thinking about color may activate all memories related to color and thereby think about her child's jellybean collection – the insight being that jellybeans have playful, bright colors (which is where the iMac designers got their colors, see "Who is Jonathan Ive?" *Business Week*, September 25, 2006). This process, where related ideas pop into a person's head as an insight, reflects the basic cognitive process of spreading activation (Anderson & Piriolli, 1984).

In terms of idea selection, a team has properties that an individual does not multiple evaluation schemes. Individuals use simplified cognitive models of the problem, called *representations*, to guide the evaluation of ideas. Representations filter out seemingly irrelevant aspects of a problem and highlighting seemingly relevant aspects. Thus a representation is the framework with which to evaluate how useful an idea is, and whether it should be selected. However, since representations are simplifications of the task (Hinsley, Hayes, & Simon, 1977; Newell & Simon, 1972) intended to make problem solving manageable given cognitive capacity limits (Simon, 1979), the resulting simplified model can miss important and useful aspects of the problem. In a team, people with different perspectives will create different representations, and these can enlarge the ways in which the team can think about what is valuable. In the above iMac example, the people who saw utility in the design of a computer added value to the outcome. They now had a way to make a computer more marketable *in addition to* improving the technological aspects.

An increasing body of research has shown that diverse teams rarely achieve creative synergy (Bettenhausen, 1991; Hambrick, Cho, & Chen, 1996; Milliken & Martins, 1996; Simons, Pelled, & Smith, 1999; Williams & O'Reilly, 1998). The question that needs to be asked at this point is why teams are not hotbeds of creativity. Teams have the capacity to spur more ideas in its members, and this would only be magnified as people have more disparate information (and hence the overall set of knowledge in the team gets bigger). Teams also have more ways to identify and select useful ideas, leading to fewer missed opportunities or suboptimal choices due to being unaware of the potential for adding value. To answer this question, we need to identify the barriers or forms of process loss that teams face when attempting to capitalize on their increased informational variety and memory capacity. We propose that team relational support will help teams achieve greater creativity by mitigating these process losses and turn to describing how this occurs.

TEAM RELATIONAL PROCESSES SUPPORTING IDEATION

The first question we ask is why ideational potential is not realized, and what relational processes can do to help. Fundamentally, people must share their unique ideas for them to either explicitly or implicitly trigger new thought combinations in other team members.[1] We argue that there are three forms of process loss experienced by creative teams that diminish processes of ideation, namely, (1) the idea is not shared out of habit, (2) the idea is not shared out of apprehension, or (3) the idea is shared but misunderstood.

Fig. 1 summarizes each type of process loss relevant to ideation and how team relational support helps teams prevail.

Habit

Often teams develop norms that, unintentionally or with good intentions, limit the sharing of unique information. A clear example of the unintentional norm that inhibits sharing is the common information effect (Stasser & Stewart, 1992) – that teams tend to focus on commonly shared rather than unique information. While the common information effect is more likely in teams with no expectation of differential expertise among its members (Stasser, Stewart, & Wittenbaum, 1995; Stewart & Stasser, 1995),

	Barriers	**Instrumental Support**	**Emotional Support**
Definition	*Process losses in creative teams*	*Advice, help, information exchanged over time*	*Flow of emotional concern between people*
Ideation	*Unshared ideas *Poor understanding	*Norms to share ideas *Increased attention to ideas *Increased effort to integrate	*Psychological safety *Trust
Selection	*Increased effort *Conflict	*Persist in support of teammates' ideas *Respect for ideas don't understand	*Buffers receipt of negative criticism *Openness to seeing value in teammates' ideas *Decreases defensiveness

Fig 1. Relational Support can Help Teams overcome Barriers to Creativity.

we argue that people often think other's viewpoints are more similar to each other than they actually are (Ross, Greene, & House, 1977). Thus even in cross-functional teams, people might expect uniformity of viewpoint beyond what is warranted (Cronin & Weingart, 2007). The result is a tendency toward sharing common information (even when that is a tiny subset of the total team knowledge), which would decrease the ability to generate new ideas.

Alternately, people may simply not share ideas because they are too busy trying to accomplish their tasks. This is particularly likely if teams experience extreme time pressure (Mueller et al., 2003) or any stressor which tends to narrow the team's attentional focus (Staw, Sandelands, & Dutton, 1981). Specifically, extreme time pressure a common feature of modern workplaces (Perlow, 1999; Perlow, Okhuysen, & Repenning, 2002), focuses teammates on task efficiency – this diminishes teammates' attention to innovative ways of performing the specific task – thus diminishing creativity. Additionally, a common problem with creative ideas is that one cannot know how close one is to a breakthrough (Metcalfe, 1986; Metcalfe & Weibe, 1987). Thus one will not be able to make a good judgment as to whether he or she should stop working in order to confer with teammates in hopes for either promoting or discovering a breakthrough. Thus with the good intentions of trying to get work done, people inadvertently choose not to share ideas because they mistakenly think it will not produce anything worth the cost.

Fig. 1 illustrates that both instrumental and emotional support can help teams overcome barriers associated with habitually withholding ideas. Specifically, instrumental support – the perception that teammates are helping, exchanging information, and providing advice in supportive ways – should (via obligation) instigate the exchange of these behaviors over time, thereby overcoming habits to withhold ideas. By definition team relational support is the perception that the exchange of information, advice, and help enhances functioning; thus, social support will create a store of memories where spending the cost to engage another teammate was worthwhile. For example, in teams where there has been a history of appraisal support, teammates will be more inclined to share because they would expect useful feedback. Similarly, when teammates historically help one another by explaining information in-depth, or holding impromptu review sessions, this promotes the value of asking for help or clarification when needed. This raises the motivation to share an idea, even an unformed one, or potentially seek an idea because teammates will use past successes rather than the future likelihood of success (which is hard to gauge) to direct their behavior.

Over time, sharing new ideas may become both habitual and expected in a team, and thus become a norm. Such a norm would survive team member turnover, and thus make it a legitimate group level property of this team.

Proposition 1. The reciprocity created by team relational social support will increase the amount of unique ideas shared.

Proposition 2. Over time the exchange of socially supportive behaviors will generate team norms of social support.

Teammates may also choose not to exchange information because they fear negative evaluation from other team members (Diehl & Stroebe, 1987), because they fear that team members may steal their ideas (Morrison & Milliken, 2000), or because they fear unjust criticism (Edmonson, 1999). People can fear the attribution of incompetence as a consequence of asking for help (Lee, 1997). Alternately, people may not want to expend the increased effort associated with providing information to someone who lacks experience (Cohen & Levinthal, 1990) or when documentation levels are low (Hansen, Mors, & Lovas, 2005).

With regard to evaluation apprehension and its related worries, decades of research on the stress-buffering hypothesis proposes that perceived social support aids health by promoting a person's ability to cope with stressors in the environment (Cohen et al., 2000). Coping represents a person's attempt to marshal the resources to work toward one's aims. Team relational support promotes coping and buffers stress by increasing the person's perception that they have resources to address the problem and thereby minimizing the extent to which a team member views idea sharing as threatening (Lazarus, 1991; Lazarus & Folkman, 1984). Because team members of emotionally supportive teams perceive they have more resources available to help them achieve their goals, they should experience more emotional resilience in the face of critical remarks. Additionally, norms in emotionally supportive teams promote the expression of emotional concern motivating team members to frame any criticism in constructive and positive ways. Again, because team relational support occurs over time, the process whereby emotional support enhances coping is not discrete, but ongoing and expected. In sum, access to emotional support over time should decrease both the number of critical remarks made by teammates as well as the perception that teammates have that critical remarks are threatening.

By allowing support recipients to perceive the have more resources in their environments, social support from teammates may help transform negative information or experiences into opportunities for creativity.

For example, teammates may disagree vehemently or may experience external pushback about their creative ideas which may challenge other manager's authority or control (Morrison & Milliken, 2000). The receipt of emotional support from other teammates may buffer the extent to which a team member perceives the disagreement as problematic. First, emotionally supportive teams share trust, reassurance, and the flow of emotional concern, fostering an environment of psychological safety, promoting the open discussion of new ideas, and voicing of mistakes (Edmonson, 1999).

Second, emotional support may help teams engage in effective coping. Research on coping identifies two general typologies, emotional focused coping – managing emotions in an attempt to escape the problem; and problem focused coping – directly confronting the problem (Lazarus & Folkman, 1984). In general, research shows that a combination of both types of coping can help one achieve goals – specifically, every problem has an emotional and nonemotional component and people should address both to achieve desired outcomes (Lazarus & Folkman, 1984). Emotional support automatically provides teams with sufficient emotion focused coping to help mobilize efforts toward directly solving problems. An increasing body of research hints at this association. For high levels of useful coworker feedback as well as high levels of coworker support, job dissatisfaction positively related to individual creativity (Zhou & George, 2001). Additionally, negative affect positively related to creativity when trust and developmental feedback (both aspects of social support) from the supervisor was high (George & Zhou, 2007).

Proposition 3. Increased relational support will lead to more idea sharing when evaluation apprehension is high.

Fig. 1 shows that one additional form of process loss when teams engage in idea sharing involves whether those ideas are understood. While sometimes teammates ideas are easy to build on, other times they may not be. For example, compare the insight that that attractive styling would increase computer marketability for the iMac to the insight that grocery store coupons punished loyal customers and should be replaced with club memberships. The former insight is easy to understand and think about productively (e.g., how can I make something look attractive?), while the latter is much less intuitive and does not lend itself to easy idea growth (e.g., one could wonder how coupons punish customers, what a club membership means, and why one would join). When people do not really understand other's ideas, or how they can be related to one's own, it limits the new ideation that can occur.

One way team relational support may help this is via the same obligation mechanisms discussed in Proposition 1. The incentive to receive support at a later date and/or repay for the support already given (Cohen et al., 2000; House, 1981) obligates one to expend time and energy in order to understand the idea. Note that obligation is critical here, because the benefit of paying attention and sharing ones thoughts is often not to the giver. That is, if I want you to help me understand something, the cost is that you need to spend time helping me regardless of whether you see value in the enterprise. Alternately, if I am arguing that your idea should be modified, that represents a further cost to you in terms of thought and work.

Again, as with Proposition 1, the continual exchange of support can alter the norms or culture of the team. Relational exchange norms may promote behaviors like asking questions or holding review sessions for teammates above and beyond exchange norms driven by coordinating work tasks. This may have the secondary effect of increasing people's ability to understand each other's perspectives (Cronin, Bezrukova, Weingart, & Tinsley, 2004) and in turn have more efficient idea transfer. That is, if a team works together long enough, members will soon gain a better understanding of how they each see the world, and this should make the communication of meaning more efficient and error free (Weber & Camerer, 2003). For example, if a team member were to say "We need to be tough on this issue," the rest of the teammates would have a better understanding of what tough implies, and how to incorporate that into their own thinking. Shared understanding develops as a byproduct of the information and appraisal exchanged in socially supportive teams, as these help clarify each others' perspectives.

Proposition 4. The reciprocity created by team instrumental social support will increase the likelihood that teammates integrate one-another's ideas.

TEAM RELATIONAL PROCESSES SUPPORTING IDEA SELECTION

Once novel ideas are brought to the attention of the team, there still needs to be selection from among those ideas (i.e., the better ideas need to be culled and developed). As we argued earlier, teammates may have different representations of the problem, leading to a broader way of seeing value.

However, others have argued that these perspectives are more often lead to competition than integration (Cronin & Weingart, 2007). That is, different perspectives are not accommodated, instead, they are argued against as incorrect – lacking validity. Thus, Fig. 1 identifies that two primary forms of process loss experienced by teams engaged in idea selection. Specifically, creative teams must overcome barriers associated with the additional effort required to make other teammates see the potential of a new idea, and the conflict experienced when teams hold very different evaluation criterion for selection.

The barrier associated with getting others to see the value of an idea involves the increased effort one needs to expend, while simultaneously overcoming the feelings of frustration that may ensue. This is especially true if an idea seems obvious to the supporters. Those who do not see the "obvious" benefit after it is explained to them may be regarded as obtuse, and this attribution can lower motivation to continue trying to teach the idea detractors why the idea is useful. It can also simply be frustrating when people "don't get it." One should note the parallels between trying to get teammates to see one's perspective on value, and the difficulties previously discussed getting teammates to understand each others' ideas. Thus, these processes will benefit from informational, appraisal, and instrumental support in the same way that we discussed in the preceding section.

Yet the process of judging other's ideas values is likely to be more emotionally provocative because people can be attached to their ideas. Supporters of an idea are likely to overweight the utility of the idea, especially if they are the creators of the idea. People tend to weight the opinions of others less heavily than their own (Yaniv, 2004), and this tendency increases the more discrepant that opinion is from one's own (Yaniv & Kleinberger, 2000). People can also be defensive when their ideas are criticized. Here is where emotional support will be especially helpful. Specifically, research on creative teams identifies that social support promotes positive affect (Madjar, Oldham, & Pratt, 2002) and intrinsic motivation (Amabile, 1996). Amabile notes and Alice Isen empirically demonstrates that individuals often experience positive mood states when intrinsically motivated (Isen & Reeve, 2005). Positive mood relates to creativity by broadening cognitive pathways and scope of attention (Fredrickson & Branigan, 2005) – increasing the random combination of seemingly disparate ideas (Isen, Daubman, & Nowicki, 1987). At the group level, positive affect via emotional support may make teammates more open to hearing and responding to the questions of teammates who do not see the value of the idea.

Proposition 5a. Team emotional social support will increase openness to others ideas.

Proposition 5b. Team emotional social support will reduce defensiveness when people's ideas are criticized.

One property of the team selection process that does not happen in an individual is conflict. Often conflict over task relevant ideas is thought of as a positive force that can push the development of the ideas (task conflict, see Jehn, 1995), or even spur new ideas (constructive controversy, see Tjosvold, 1997). The problem is that constructive controversy is often not so constructive, as on balance task conflict is harmful (De Dreu & Weingart, 2003). When teammates start fighting about ideas, this can turn into something more relational (Simons & Peterson, 2000). This can spiral downward (Lovelace et al., 2001) leading to a decrease in groups overall effectiveness (and we might assume snuffing out creativity as well). Note, however, that the chain of events is that conflict over the task becomes personal. Logically, therefore, forces that can prevent conflict from spiraling downward should help maintain the task focus of conflict. Here again we think that emotionally supportive groups have an edge because the balance of good will should prevent teammates from making negative attributions about each other. Similarly, people will probably be less inclined to be aggressive or nasty to those with whom they have a balance of positive emotion.

Proposition 6. Instrumental and emotional support will decrease the amount of relational conflict and increase the amount of task conflict.

FUTURE RESEARCH

Creativity research should focus on socially supportive teams not only as an input to team's creative products, but as a critical factor in the team's creative process. For example, teams, especially diverse teams, are often assembled with the hope that the team members will work synergistically (e.g., Kanter, 1988). Only infrequently is this hope realized (Bettenhausen, 1991; Hambrick et al., 1996; Milliken & Martins, 1996; Simons et al., 1999;

Williams & O'Reilly, 1998). We have argued why understanding the relational aspect may help us to help teams utilize diverse perspectives in productive ways. This is a challenge for researchers because a focus on relational exchange norms requires a longitudinal perspective that is poorly suited to assessment in lab contexts when employing nominal teams. We propose that unlike individual creative processes, team creative processes require the construction and assessment of a variety of thoughts by multiple independent teammates, and this type of "cognitive coordination" is challenging. We have suggested specific areas where the potential benefits of teams can go unrealized, as well as why that would happen. Empirical work is now needed on these specific pathways to investigate how creative teams fail and whether socially supportive processes do indeed aid the creative process.

There are many different resources that relationships provide, and so to truly understand them we need to move beyond one dimensional summary statistics for relationships. For example, if we revisit the conflicting findings as to whether strong ties diminish creativity (Brass & Krackhardt, 1999; Granovetter, 1973) or bolster them (Amabile et al., 1996), this could be more easily reconciled if the former was limited to an informational redundancy argument, and the latter to a reciprocation and emotional support argument. Figuring out the strong tie-weak tie contradiction is particularly important from an organizational perspective, as using tie strength to build teams takes a purely sociological view of how relationships at work develop without considering formal team structures that govern the assembly of teams. In other words, organizational tasks, not homophily dictate formal team structures.

In order to further what we know about creative endeavors – theory and measures of social support could use further development. One task would be to distinguish it from similar seeming constructs, such as cooperation amongst teammates (which we argue is more task focused while social support is more relationship focused). People can cooperate because of extrinsic rewards, and mistaking this for relational social support would take away many of the benefits we have suggested relational social support brings because of the lack of any obligation mechanism. Another related construct is cohesion – a state of member attraction to the group (Mullen & Copper, 1994). We argue that social support may provide many of the benefits of team cohesion without some of the associated costs. So whereas cohesion can begin to decrease creativity as it begins to encourage conformity (as Woodman et al. (1993) identified in their seminal work on innovation), team relational support should not because it works based on the exchange of favors and social resources.

SUMMARY AND CONCLUSION

Creativity theory has generally examined social support as a type of climate that provides individuals with resources to facilitate their own creativity (Hunter, Bedell, & Mumford, 2007). In this view social support is a "social phenomenon" where support is exchanged because of norms that organizations hold regardless of whether actors have interpersonal relationships with one another. Instead, focusing on social support at the team level presents an opportunity to explore social support as a relational phenomenon – team relational support – where individuals exchange resources because of obligations to maintain relationships. We propose that team relational support helps teams overcome process loss and barriers to generate and select their most creative ideas. Specifically, teammates may experience difficulty sharing their ideas during idea generation because of habit, time pressure, evaluation apprehension, and understanding. Selecting the most creative ideas may prove equally challenging because of the added effort and conflict experienced when teammates attempt to convince others' that their divergent perspectives have value.

Because team relational support takes considerable investment of time to give, it comes with the expectation that recipients will reciprocate with appropriate delay. Hence, teams with high levels of instrumental support will experience an increased sense of obligation to exchange help, information and advice to maintain team relationships. Additionally, teams with high levels of team emotional social support promote the exchange of emotional concern and empathy between teammates. In sum, the exchange of instrumental resources between teammates will generate norms of exchange but more importantly the needed attention, effort, and respect to share and persist in support of novel ideas. The experience of team emotional support buffers teammates from negative criticism helping them perceive stressors as less negative and increasing positive affect and corresponding openness to new and different ideas. Both the instrumental and emotional dimensions of team relational support are important to facilitate team creative process.

One goal of this chapter was to bring the relational perspective to group creativity theory and to urge future researchers to view constructs commonly studied in the literature (e.g., team member exchange, interpersonal citizenship behaviors, trust, network ties) from a relational perspective. Relational perspectives extend what we know by focusing on the interpersonal relationship – the long-term mutual influence and interdependence experienced between teammates – as the lens through which resource exchange occurs. This perspective suggests that the mere receipt or exchange of resources is an insufficient way to think about whether interpersonal behaviors enhance creativity because these exchanges are enhanced or degraded based on the relational context in which they occur. For example, consider the situation where one teammate helps another in a team context where relational support is low. When relational support is low, helping attempts are nonnormative and do not occur because of obligations to maintain positive relationships. Instead, in teams with low relational support levels, help recipients may attribute help givers with the desire to correct the recipient's mistakes or poor performance. As such, helping attempts can actually threaten and degrade recipients self esteem in low relationally supportive team contexts.

Because teams are relational contexts, theory regarding group level creativity that eschews a relational perspective may portray group creative processes inaccurately. In this vein, the field of creativity research should develop a fully articulated model of interpersonal relationships in creative groups. In sum, the current chapter hopes to encourage and serve as a foundation for future efforts to develop theory of how interpersonal relationships encourage group creativity.

NOTE

1. This may seem contrary to the effect of production blocking that is common to brainstorming, but note that the context is different. It is not that people are all trying at once to come up with ideas, the ideas arise as people are executing their task, and this occurs across a longer period of time.

REFERENCES

Amabile, T. (1988). *A model of creativity and innovation in organizations* (Vol. 10). Greenwhich, CT: JAI Press.

Amabile, T. M. (1978). Effects of extrinsic constraint on creativity. *Dissertation Abstracts International*, *38*(9-B), 4531–4532.

Amabile, T. M. (1996). *Creativity in context: Update to "The Social Psychology of Creativity"* (Vol. 317). Boulder, CO: Westview Press.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*, 367–403.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, *39*(5), 1154–1184.

Anderson, J. R., & Piriolli, P. L. (1984). Spread of activation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *10*, 791–798.

Bettenhausen, K. L. (1991). Five years of group research: What we have learned and what needs to be addressed. *Journal of Management*, *39*, 123–148.

Brass, D. J., & Krackhardt, D. (1999). The social capital of twenty-first-century leaders. In: J. G. Hunt & G. E. Dodge (Eds), *Out-of-the-box leadership: Transforming the twenty-first-century army and other top-performing organizations. Monographs in leadership and management* (Vol. 1, pp. 179–194). Stamford, CT: Jai Press, Inc.

Campbell, D. T. (1960). Blind variation and selective retentions in creative thought as in other knowledge processes. *Psychological Review*, *67*(6), 380–400.

Clark, M. S., & Mills, J. (1993). The difference between communal and exchange relationships: What it is and is not. *Personality and Social Psychology Bulletin*, *19*(6), 684–691.

Cohen, S., Underwood, L. G., & Gottlieb, B. H. (2000). *Social support measurement and intervention: A guide for health and social scientists*. New York, NY: Oxford University Press.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly. Special Issue: Technology, organizations, and innovation*, *35*(1), 128–152.

Cronin, M. A., Bezrukova, K., Weingart, L. R., & Tinsley, C. (2004, July). Agree or not agree? The role of cognitive and affective processes in group disagreements. Presented at the International Association for Conflict Management Conference, Pittsburgh, PA.

Cronin, M. A., & Weingart, L. R. (2007). Representational gaps, information processing and conflict in functionally diverse teams. *Academy of Management Review*, *32*, 761–773.

De Dreu, C. K. W. (2006). When too little or too much hurts: Evidence for a curvilinear relationship between task conflict and innovation in teams. *Journal of Management*, *32*(1), 83–107.

De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, *88*, 741–749.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, *53*(3), 497–509.

Edmonson, A. (1999). Psychological safety and learning behavior in work teams. *Human Resources Abstracts*, *34*(4).

Elsbach, K. D., & Kramer, R. M. (2003). Assessing creativity in Hollywood pitch meetings: Evidence for a dual-process model of creativity judgments. *Academy of Management Journal*, *46*(3), 283–301.

Fiske, A. P. (1992). The four elementary forms of sociality: Framework for a unified theory of social relations. *Psychological Review*, *99*(4), 689–723.

Flynn, F. J. (1999). *Understanding reciprocity: A study of favor exchange in organizations*. Unpublished doctoral dissertation, University of California, Berkeley, CA.

Fredrickson, B. L., & Branigan, C. (2005). Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition & Emotion*, *19*(3), 313–332.

George, J. M., & Zhou, J. (2007). Dual tuning in a supportive context: Joint contributions of positive mood, negative mood, and supervisory behaviors to employee creativity. *Academy of Management Journal*, *50*(3), 605–622.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*(6), 1360–1387.

Hambrick, D. C., Cho, T., & Chen, M. J. (1996). The influence of top management team heterogeneity on firms' competitive moves. *Administrative Science Quarterly*, *41*, 659–684.

Hansen, M. T., Mors, M. L., & Lovas, B. (2005). Knowledge sharing in organizations: Multiple networks, multiple phases. *Academy of Management Journal*, *48*(5), 776–793.

Hinsley, D. A., Hayes, J. R., & Simon, H. A. (1977). From words to equations: Meaning and representation in algebra word problems. In: M. A. Just & P. A. Carpenter (Eds), *Cognitive Processes in Comprehension* (pp. 89–101). Hillsdale, NJ: Lawrence Erlbaum and Associates.

House, J. S. (1981). *Work stress and social support*. London, UK: Addison-Wesley.

Hunter, S. T., Bedell, K. E., & Mumford, M. D. (2007). Climate for creativity: A quantitative review. *Creativity Research Journal*, *19*(1), 69–90.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, *52*(6), 1122–1131.

Isen, A. M., & Reeve, J. (2005). The influence of positive affect on intrinsic and extrinsic motivation: Facilitating enjoyment of play, responsible work behavior, and self-control. *Motivation and Emotion*, *29*(4), 297–325.

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly*, *40*, 256–282.

Kanter, R. M. (1988). When a thousand flowers bloom. *Research in Organizational Behavior*, *10*, 97–102.

Kurtzberg, T. R., & Amabile, T. M. (2001). From Guilford to creative synergy: Opening the black box of team-level creativity. *Creativity Research Journal. Special Issue: Commemorating Guilford's 1950 Presidential address*, *13*(3–4), 285–294.

Lazarus, R. S. (1991). *Emotion and adaptation*. New York, NY: Oxford University Press.

Lazarus, R. S., & Folkman, S. (1984). *Stress, coping, and adaptation*. New York: Springer.

Lee, F. (1997). When the going gets tough, do the tough ask for help? Help seeking and power motivation in organizations. *Organizational Behavior and Human Decision Processes*, *72*(3), 336–363.

Lovelace, K., Shapiro, D., & Weingart, L. R. (2001). Maximizing cross-functional new product teams innovativeness and constraint adherence: A conflict communications perspective. *Academy of Management Journal*, *44*(4), 779–783.

Madjar, N., Oldham, G. R., & Pratt, M. G. (2002). There's no place like home? The contributions of work and nonwork creativity support to employees' creative performance. *Academy of Management Journal*, *45*(4), 757–767.

Mannix, E., & Neale, M. A. (2006). What differences make a difference? The promise and reality of diverse teams in organizations. *Psychological Science in the Public Interest*, *6*, 31–55.

Metcalfe, J. (1986). Feelings of knowing in memory and problem solving. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *12*, 288–294.

Metcalfe, J., & Weibe, D. (1987). Intuition in insight and non-insight problem solving. *Memory and Cognition*, *15*, 238–246.

Milliken, F., & Martins, L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review*, *21*, 402–433.

Morrison, E. W., & Milliken, F. J. (2000). Organizational silence: A barrier to change and development in a pluralistic world. *Academy of Management Review*, *25*(4), 706–725.

Mueller, J. S., Amabile, T. M., Simpson, W. B., Hadley, C. N., Kramer, S. J., & Fleming, L. (2003, August). The influence of time pressure on creativity in organizations. Paper presented at the Academy of Management Conference, Denver, CO.

Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and performance: An integration. *Psychological Bulletin*, *115*(2), 210–227.

Newell, A., & Simon, H. A. (1972). *Human problem solving*. Engelwood Cliffs, NJ: Prentice-Hall.

Parris, M. A. (2003). Work teams: Perceptions of a ready-made support system? *Employee Responsibilities and Rights Journal*, *15*(2), 71–83.

Perlow, L. (1999). The time famine: Toward a sociology of work time. *Administrative Science Quarterly*, *44*, 57–81.

Perlow, L. A., Okhuysen, G. A., & Repenning, N. P. (2002). The speed trap: Exploring the relationship between decision making and temporal context. *Academy of Management Journal*, *45*(5), 931–955.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: Aggregating across people and time. *Journal of Organizational Behavior*, *25*(2), 235–257.

Polzer, J. T., Milton, L. P., & Swann, W. B., Jr. (2002). Capitalizing on diversity: Interpersonal congruence in small work groups. *Administrative Science Quarterly*, *47*(2), 296–324.

Reis, H. T., Collins, W. A., & Berscheid, E. (2000). The relationship context of human behavior and development. *Psychological Bulletin. Special Issue: Psychology in the 21st Century*, *126*(6), 844–872.

Ross, L., Greene, D., & House, P. (1977). The false consensus effect: An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, *13*(3), 279–301.

Simon, H. A. (1979). *Models of thought*. New Haven, CT: Yale University Press.

Simons, T., Pelled, L. H., & Smith, K. A. (1999). Making use of difference: Diversity, debate, and decision comprehensiveness in top management teams. *Academy of Management Journal*, *42*, 662–673.

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intergroup trust. *Journal of Applied Psychology*, *85*, 102–112.

Simonton, D. K. (1988). *Scientific genius: A psychology of science* (229). New York, NY: Cambridge University Press.

Simonton, D. K. (2003). Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin*, *129*(4), 475–494.

Stasser, G., Stewart, D., & Wittenbaum, G. M. (1995). Expert roles and information exchange during discussion: The importance of knowing who knows what. *Journal of Experimental Social Psychology*, *31*, 244–265.

Stasser, G., & Stewart, D. D. (1992). The discovery of hidden profiles by decision making groups: Solving a problem versus making a judgment. *Journal of Personality and Social Psychology*, *63*, 426–434.

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat-rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly*, *26*(4), 501–524.

Stewart, D. D., & Stasser, G. (1995). Expert role assignment and information sampling during collective recall and decision making. *Journal of Personality and Social Psychology*, *69*, 619–628.

Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, *45*(2), 315–330.

Tjosvold, D. (1997). Conflict within interdependence: Its value for productivity and individuality. In: C. K. W. De Dreu & E. Van de Vliert (Eds), *Using conflict in organizations* (2nd ed., pp. 651–717). Palo Alto, CA: Consulting Psychologists Press.

Weber, R. A., & Camerer, C. F. (2003). Cultural conflict and merger failure: An experimental approach. *Management Science*, *49*, 400–415.

Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. *Research in Organizational Behavior*, *20*, 77–140.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, *18*, 293–321.

Yaniv, I. (2004). Receiving other people's advice: Influence and benefit. *Organizational Behavior & Human Decision Processes*, *93*, 1–13.

Yaniv, I., & Kleinberger, E. (2000). Advice taking in decision making: Egocentric discounting and reputation formation. *Organizational Behavior & Human Decision Processes*, *83*, 260–281.

Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, *44*(4), 682–696.

IS GROUP CREATIVITY REALLY AN OXYMORON? SOME THOUGHTS ON BRIDGING THE COHESION–CREATIVITY DIVIDE

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ABSTRACT

The papers in this volume can be characterized by a "cohesion–creativity divide." On one side are scholars who describe the very nature of groups – its norms, interaction patterns, social influence, and hierarchy – as anathema to creativity. On the other side are advocates of cohesion and coordination, where the primary benefits of groups are to draw people together, form common ideas, and integrate knowledge into shared solutions. To bridge this "cohesion–creativity divide," I have proposed four modes of resolution. They are: (1) searching for an overarching design that incorporates both integration and differentiation, (2) emphasizing dimensions of creativity most needed at a particular stage of the creative process, (3) promotion of a strong but creative culture, and (4) redefining creativity so that the tradeoffs inherent in the cohesion–creativity divide are drastically reduced. Each of these solutions is discussed in light of the papers in this volume as well as the creativity literature as a whole.

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Before commenting on the chapters in this volume I should confess to some preexisting prejudices. Ever since graduate school, I have sworn allegiance to the evolutionary approach to creativity (Campbell, 1960; Simonton, 1999a), where creative products are thought to be a function of both variety and selective-retention processes. This means that I have long advocated increasing creativity by boosting the variety of inputs, be they sources of information, skills, or viewpoints (Staw, 1990, 1995). The greater the variety, the greater is the chance of producing a creative product. This also means that I believe that variation in inputs (or any given set of ideas) should not be filtered prematurely – at least before they can be tested for feasibility or appropriateness as potential solutions. I do not go as far as Campbell (1960) in advocating "blind" variation, where any conscious effort to increase diversity is inevitably trumped by random variation. Nor do I argue, like Simonton (1999b), that the sheer quantity of ideas (rather than their quality) is the primary determinant of making a creative contribution.

My own interpretation of the evolutionary approach (Staw, 1990) can be portrayed by a simple "funnel model," where creative products are a function of the breadth (or variety) of the input and a filtering process (selective retention) in which numerous possibilities are reduced to a manageable few. The funnel model (and the evolutionary approach on which it is based) can be applied to multiple levels of creativity – from the individual to groups to organizations. Using this model, anything that promotes breadth and variety of thought – no matter whether it is individual openness and flexibility, group diversity, or an organization's willingness to take risks – can be considered the friend of creativity. Conversely, anything that constricts one's thinking or the range of alternatives being considered – such as fear of censure, norms supporting existing practices, or conformity in thought – can be considered the enemy of creativity.

From the evolutionary perspective, several of the chapters in this volume extend and amplify our knowledge of creativity by emphasizing new sources of variety. For example, Bezrukova and Uparna argue that faultlines in a group, often the source of interpersonal conflict, can further diversity in information and group creativity. Likewise, Wong, Kray, Galinsky, and Markman show how one can use counterfactual thinking (or imagining new alternatives to reality) to stimulate creative performance. Ziebro and Northcraft also demonstrate how broadening our interpersonal networks to deeply dissimilar others can provide new sources of information and alternative perspectives to facilitate creativity. Finally, Mueller and Cronin argue that social support can help teams overcome people's inhibitions in promoting creative ideas by broadening the safety net for those with deviant views.

From the evolutionary perspective there are also several chapters showing how creativity can be restricted in group and organizational settings. Ziebro and Northcraft point out that people are most likely to interact with those who are least likely to enhance their creativity, since people are generally attracted to those who are most similar to themselves. Although we might on occasion be placed in a group with others who are different from ourselves, other interpersonal forces can still sidetrack or diminish creativity. As Wiltermuth argues, hierarchies tend to spring up in groups over time even if those groups had begun as relatively egalitarian gatherings. And, as hierarchies are developed, powerful group members tend to dominate the airtime, with less powerful members (often those with alternative backgrounds and perspectives) becoming inhibited. Baruuh and Paulus similarly elaborate many reasons why the products of group brainstorming generally fall short of the simple average of individual contributions in terms of novel or creative ideas. Due to limitations in air time, an emphasis on shared ideas, and inhibitions against truly deviant ideas, face-to-face groups fail to utilize the full variety of information held by group members.

Although the evolutionary model preaches the virtues of variety and scorns any restrictions on information or viewpoint, the model is somewhat agnostic when it comes to selective-retention mechanisms. For example, Simonton (1999b) notes that the market sorts out winners and losers, and, as a result, the sheer quantity of creative products is what determines a person's creative contribution. He argues that the important thing is to be prolific, leaving the evaluation of products to others – be they critics, historians, or the economic marketplace. Other researchers (e.g., Gardner, 1999; Mumford, 1999; Sternberg, 1998) maintain that it is indeed possible for a creative individual or group to sort through the range of ideas to find those most likely to succeed. In fact, one might argue that extremely creative people are those who not only possess a reservoir of ideas, but have the capacity to recognize an especially good solution when they see it. The great artist or scientist does not rest with the generation of ideas. He or she selects the best solution and pushes that solution to some sort of completion. This is why many creative people (and especially those who have achieved greatness) possess something of a contradictory nature. Although they display enormous curiosity and flexibility in problem identification and idea generation, they also show great tenacity in implementing their preferred solutions. Such persistence (or selective-retention) may be why certain artistic or scientific products ultimately reach acceptance in the economic, artistic, or intellectual marketplace.

At the organizational level, procedures that help sort ideas into the most feasible or beneficial can often be at odds with those that encourage variety. For example, having to meet increasingly stringent budget demands may cause projects to die before reaching a full-scale test of marketability, and may even preempt the consideration of some potentially creative ideas. At the group level, there are also contradictions inherent in variety generation versus selective-retention processes. For example, Rietzschel, DeDreu, and Nijstad describe how different stages of the creative process are likely to be influenced by different variables. They argue that the facilitation of diverse ideas that results from having team members feel psychologically safe does not help when it comes to optimal idea selection, a process that profits from dissent and more critical thinking. Other authors in this volume have also noted that when creativity moves from the laboratory to the organization it is necessary to pay more attention to the shared experiences of group members. Derue and Rosso describe the importance of team development (including a set of roles and interdependencies) for real-life teams that are expected to perform creatively in a quick and almost routine fashion. Gino, Todorova, Miron-Spector, and Argote elaborate the benefits of shared experience, arguing that groups are more creative once they know who knows what, making it easier to share knowledge and coordinate their efforts. Similarly, Bolinger, Bonner, and Okhuysen stress the importance of the "glue role" in creative groups – that is, having at least one (selfless) team member who spends more time integrating and facilitating the ideas of others rather than promoting his or her own ideas. Finally, Kaplan, Brooks-Shesler, King, and Zaccaro emphasize the positive contribution of conformity, arguing that strong group norms and conformity can help reduce conflict, coordinate behaviors, and build commitment to a solution during the implementation phase of creativity.

THE COHESION–CREATIVITY DIVIDE

So far, I have sorted the papers in this volume according to whether they have addressed variety or selective-retention mechanisms. Such sorting is a useful exercise, since it illustrates how various group structures and procedures can influence either (or both) of these evolutionary mechanisms. However, this categorization only hints at a more fundamental split among the papers in this volume as well as within the group creativity literature as a whole – what I will call the "cohesion–creativity divide."

On the one hand are essays that decry the reduction in creativity that comes from the group experience. To members of this camp, group creativity is almost an oxymoron. The very nature of groups – its norms, interaction patterns, social influence, and hierarchy – are anathema to creativity. Since creative solutions involve the mustering of new, divergent, and deviant ideas, the simple act of bringing people together in settings that allow them to influence each other (especially when social norms and hierarchy are involved) provides serious limitations to variety and hence creativity.

On the other hand, several essays in this collection point to the coordination and efficiency of the group experience. With these papers, there is an emphasis on how individuals can draw upon the knowledge of others in the group, work quickly under time pressure, help each other choose the most valuable contributions, and build commitment to common solutions. The benefit of groups is to draw people together, to form common ideas from its constituent parts, and to integrate knowledge into a shared solution. For these authors, the benefits of cohesion seem to trump any losses in variety, providing a positive contribution to group creativity.

WAYS TO BRIDGE THE DIVIDE

The inherent contradiction between cohesion and creativity might be resolved in a number of ways. Probably the simplest resolution would be to recognize that the creative process is something that comes in stages. As many have already noted, creative artists, scientists, and entrepreneurs do not just dream up ideas and then leave them on the floor of the studio, lab, or conference room. Ideas must be implemented or at least sold to others in order for there to be a creative accomplishment recognized by the public, or even one's own peer group. Scientists must convince their colleagues of an imminent breakthrough; creative artists must find a way to display their wares; and in terms of high-tech firms, Steve Jobs once noted that even the most innovative companies must still ship.

Rietzschel, DeDreu, and Nijstad describe how group creativity involves the stages of problem finding, idea generation, idea selection, and implementation. The dangers of social cohesion that come with the group experience would seem to apply most readily to the problem finding and idea generation stages. This is because restrictions in variety narrow the scope of a problem and serve to preclude divergent definitions of an issue. However, while groups may be hazardous places for the generation of ideas, they can be more hospitable to the selection and implementation of ideas. At these later stages, it is necessary to narrow alternatives to a manageable few and to get team members fully committed to the most preferred path. For these purposes some discipline and cohesion is desirable, or perhaps even necessary. Just as the individual creative process involves some narrowing of alternatives and persistence along a particular course of action (e.g., the funnel model), group creativity may require social influence processes to move people toward a common solution.

It should be noted that Rietzschel, DeDreu, and Nijstad are not the first to use a stage model in order to bridge the cohesion–creativity divide. At the organization level, Zaltman, Duncan, and Holbek (1973) long ago argued for a stage model in which organizations follow a more organic path in developing new products, and then switch to a more mechanistic form when concerned with implementation. They posited that innovative organizations should act as chameleons, moving from a loose and decentralized structure where autonomy is revered to a more hierarchical and orderly structure as products move from initial development to production and marketing.

Such chameleon-like behavior may, of course, be more illusion than reality. Often new product development activities are conducted by autonomous teams separated (physically and organizationally) from mainstream parts of the firm. Once an interesting idea is flushed out by the development team, it is typically handed off to others who are more skilled in production and marketing processes. Rarely does the same team follow a product from the idea to the implementation stage. Thus, the chameleon may consist of separate "organisms" living and breathing under a common skin. What this means is that it is probably unrealistic to expect a single group or organization to morph its culture over the various stages of innovation. Few entities can transform themselves from diverse, free-wheeling, and tolerant entities (great for the developmental stage) to a more organized and hierarchical approach during implementation … and then back again when the next creative task presents itself.

DIFFERENTIATION AND INTEGRATION

An alternative way to resolve the contradiction between cohesion and creativity is to posit that groups and organizations are capable of being both flexible and efficient. Instead of relying on a difficult transformation of the collectivity over time (e.g., the stage model), some theorists have argued that it is possible to have a close-knit group and creativity at the same time.

That is, rather than having people behave in radically different ways depending on the stage of innovation (e.g., idea generation vs. idea implementation), it may be possible to structure a group or organization in a way that generally fosters creativity.

Lawrence and Lorsch (1967) argued that the most effective organizations are structured in ways that can be described as both differentiation and integration. They allow units to vary widely according to different market conditions (e.g., with varying degrees of centralization, formalization, and temporal goals), yet include enough integrative devices (e.g., common oversight, shared norms, and conflict resolution techniques) to pull the disparate threads together. At the group level, such differentiation might involve having a wide variety in membership so that ethnic, age, educational, and occupational backgrounds are fully represented in the group. In order to tie these divergent viewpoints together (and perhaps to reduce the likelihood of conflict), the group might utilize common experiences, team-building, or facilitative leadership. As many scholars have noted (e.g., Chatman, Polzer, Barsade, & Neale, 1998), diverse teams can be held together by shared norms, common purposes, and an accepted hierarchy. The end result might be a relatively positive outcome for creativity, given that a differentiated and integrated group could include both the variety and selection-retention processes necessary for creative performance.

STRONG CULTURE AS FRIEND OR FOE OF CREATIVITY?

A third solution to the cohesion–creativity divide may be the most inventive. Rather than using a stage model or adopting contradictory characteristics (integration and differentiation), some scholars (e.g., O'Reilly & Chatman, 1996; Flynn & Chatman, 2001) have argued that the integrative forces of groups and organizations can be effectively channeled toward innovation. Groups and organizations can adopt norms for creativity and innovation, where social pressures push for change and adaptability rather than the status quo. While such prescriptions sound simple enough, they fly in the face of most research on social influence (see Nemeth & Staw, 1989 for a review), showing that norms generally restrict rather than expand the behavioral repertoire, that they narrow what is approved rather than set people free to explore novel and deviant paths.

Before ruling out the "strong norms" approach, however, it should be noted that some real world examples can be mustered in its defense. For instance, Sutton and Hargadon (1996) provided a rich description of brainstorming at the product development firm, IDEO. They noted that engineers used group meetings to show off their creative skills, gaining social approval when they came up with novel alternatives. Apparently, the group setting provided the motivation and outlet for creative behavior since status at IDEO was closely associated with the label of creativity. Unfortunately, because this research was based on a single case study rather than the comparison of either intact or experimental groups, we do not know whether a more individualistic approach would have produced *even greater* creativity. Using a nominal group procedure or other device to retain individual ideas (e.g., Goncalo & Staw, 2006), there might have been wider input by less vocal team members. By considering only the IDEO format, we know that brainstorming can lead to many creative products, yet we do not know whether the procedure is actually better than more individually based alternatives.

At the organizational level, O'Reilly and Chatman (1996) argue that firms with a strong culture devoted to innovation will increase innovation through normative pressure and social control. They note that people become motivated to pursue innovative activities because that is what leads to social approval and status at these firms. The logic is as simple as that of goal-setting or reinforcement theories. Yet, the predicted outcomes have not been confirmed when one considers a few important examples. At Hewlett Packard, one of the firms often cited as the paragon of both strong culture and innovation, executives were unable to recognize the merits of the personal computer being developed by Wozniac and Jobs, even though the firm specialized (at the time) in various forms of industrial equipment such as measurement and display devices. In a similar manner, IBM dismissed the importance of computer software by "giving away" the operating system for the PC to a small firm headed by a young Bill Gates. Although IBM had a very strong culture, their business model was so identified with computer hardware that the operating system was deemed to be a trivial product, one that could be safely farmed out to another firm such as Microsoft.

My point in recounting the HP and IBM examples is not to blame specific companies for their lack of foresight, but to emphasize how a strong culture might actually have served to inhibit innovation. These companies, like many others, used corporate culture as a way to define the organization – as a means for establishing their collective identity. These strong cultures also carried with them a unified view of what was most important and distinctive for the company. Their identity went beyond behavioral norms governing things like the formality of dress and styles of collaboration and conflict. Their history and shared experiences determined the general orientation and strategy of the firm. Thus, anything pulling the company in an entirely new direction, including radically different products and alternate business models, would not likely be encouraged.

REDEFINING THE COHESION–CREATIVITY GAP

As several papers in this volume have recognized, processes that transform a collection of people into a group or team – things like coordination, social norms, and hierarchy – are exactly the processes that pose limitations to variety. They work to homogenize the membership and limit its potential for deviance and novelty. At the same time, these aspects of the group experience can also help selection-retention processes. They can help teams cull a cacophony of alternatives into a chosen few so that efforts may be more focused and readily implemented. Therefore, techniques to bridge the cohesion–creativity divide have often involved devices that both differentiate and integrate the group, either in stages or as an on-going process.

A more divergent approach to resolving the tension between cohesion and creativity is to *define it away*. By this I do not mean to pretend that the division does not exist or is not important, but to argue that the divide is created, at least in part, by the way we define creativity. Currently, the most popular method of assessing creativity is through ratings of products in terms of both novelty and appropriateness (Amabile, 1983; Amabile & Mueller, 2008). From the evolutionary perspective, variety is the key driver of novelty, whereas selective-retention processes determine the feasibility or appropriateness of the solution. Therefore, if we redefine what constitutes a creative product, we may also resolve the cohesion–creativity divide.

In terms of individual creativity, much of the literature has been motivated by extreme cases of creative genius, where the person has turned an entire field in a new direction or solved a problem that has puzzled scientists for decades. The team literature has also been swayed by extreme examples like the Manhattan Project or industrial development teams that have devised a path-breaking product. While the dual criteria of novelty and appropriateness serves as a reasonable method for assessing such creative advances, one can certainly question the scoring technique. Should feasibility and novelty be equally weighted so that highly practical but very incremental solutions are considered to be as creative as more novel and less practical ideas? I think not. Lay conceptions of creativity are primarily driven by perceptions of novelty and divergence, as long as the idea appears to be generally directed toward a problem or its solution. Therefore, creativity may be best depicted by degrees of novelty, as long as the proposed solution surpasses some minimal threshold of feasibility or appropriateness.

Such a redefinition (or at least rescoring) of creativity means that variety would be the key driver of creativity. Alternatively, one might consider redefinitions that emphasize selective-retention processes. The latter approach could take its cue from extreme levels of achievement, where award winning products or solutions are not particularly divergent or novel. For example, the Nobel Prize is often awarded to a team that is first to solve an especially important problem, regardless of the style of that solution. Rather than divergence or novelty of the product, creativity might therefore be determined by the difficulty of the problem or the impact of the solution. Using this approach, one could score creativity like an Olympic event such as diving or gymnastics where a high score is the function of both difficulty and accomplishment. The relevant question is whether one has completed a noteworthy achievement (e.g., curing cancer or mapping the human genome) rather than whether the achievement is predicated upon a unique or divergent approach to the problem.

CONCLUSION

As I have noted, the papers in this volume are representative of a split in the creativity and innovation literatures. In one corner are advocates of variety and all mechanisms for increasing the diversity of input, be they at the individual, group, or organizational levels. In another corner are advocates of cohesion and mechanisms for bringing disparate people, ideas, and viewpoints together. This split especially manifests itself in arguments over group diversity, social control, and strong organizational culture.

I have elaborated four ways to resolve the cohesion–creativity divide. One can try to bridge the divide by searching for an overarching design that incorporates both integration and differentiation. Such a search will no doubt involve a tradeoff in the variety and selective-retention processes inherent in creativity, maximizing neither dimension while optimizing their joint product or outcome. Alternatively, one can emphasize the dimension most needed at a particular stage of the creative process, be it the idea generation or implementation stage. Here the question turns to how one might effectively transform a group from that which is best at generating novel ideas to that which is good at implementation. A third method for bridging the gap might emphasize a strong but creative culture – a solution that I argue is not feasible in most organizational settings. Finally, one might simply ignore the tradeoffs and difficulties inherent in the cohesion–creativity divide, and instead define the conflict away. Here one chooses to emphasize either the novelty or feasibility aspects of creativity, so that the prime determinant of creativity becomes either variety generation or selective-retention processes.

A FINAL QUESTION

Most books and articles on group creativity begin with some boasting of the increasing importance of groups in work organizations. Not so many years ago, organizations were populated by individual contributors, where employees reported to a supervisor, interacted with coworkers, and received a paycheck from the larger corporation. Today, the work landscape is certainly more interconnected and team based. The employee (especially knowledge workers) serves on many task forces or teams charged with production, planning, and service functions. These teams might come together for a specific purpose like the development of a new product or they could be charged with on-going responsibilities such as sales, service, or controlling costs in the organization. Regardless, employees typically spend a significant portion of their day in team based activities and are evaluated, at least in part, on their contributions to team effectiveness.

Though team-based work is now the norm rather than the exception, this transformation of the organizational world has evolved without serious consideration or evaluation. Although there is a long tradition in group research examining the assets and liabilities of group versus individual performance, with an acknowledgment that the whole can be greater or less than the sum of its parts (Maier, 1970; Hackman, 1992), little of this work has actually influenced management practice. Nor have group researchers voiced many cautions about the trend. Certainly there have been discussions about dysfunctions, such as groupthink and faulty decision making, following a major corporate or government disaster. And there has been the occasional study showing that the use of teams, like other popular management techniques, is more closely associated with an increase in the firm's reputation than any improvement in organizational performance (Staw & Epstein, 2000). Yet, there has been nearly total silence about whether the march toward team-based work has been beneficial or not. It is as though researchers have assumed that such a powerful management trend *must* be effective, lest it would extinguish over time. But we know better. Ineffective programs and techniques can often flourish if there is sufficient institutional support, regardless of the actual merits of the trend. As Abrahamson (1996) noted, management consultants and the popular press often conspire in promoting management fads. To this list we might add academic researchers, who can enthusiastically jump aboard a trend when it means that their particular subfield will grow in size and stature over time.

As we have seen by the papers in this volume, bringing people together in a group setting does not insure a creative outcome. Because the social cohesion provided by groups can often work against the creative process, we should be cautious in recommending a group or team solution for most organizational work. And, we should be especially wary of the team bandwagon when a central goal of the organization is innovation. Although working in a team environment can feel good, and sometimes be even exhilarating, its benefits need to be systematically compared to alternative means of performance.

REFERENCES

Abrahamson, E. (1996). Management fashion. *Academy of Management Review*, *21*, 254–286.

Amabile, T. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, *45*(2), 357–376.

Amabile, T. M., & Mueller, J. S. (2008). Studying creativity, its processes, and its antecendents: An exploration of the componential theory of creativity. In: J. Zhou & C. E. Shalley (Eds), *Handbook of organizational creativity* (pp. 33–64). New York: Lawrence Erlbaum Associates.

Campbell, D. T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, *67*, 380–400.

Chatman, J. A., Polzer, J. T., Barsade, S. G., & Neale, M. A. (1998). Being different yet feeling similar: The influence of demographic composition and organizational culture on work processes and outcomes. *Administrative Science Quarterly*, *43*, 749–780.

Flynn, F., & Chatman, J. (2001). Strong cultures and innovation: Oxymoron or opportunity? In: C. L. Cooper, S. Cartwright & P. C. Earley (Eds), *International handbook of organizational culture and climate*. Sussex, UK: Wiley.

Gardner, H. (1999). Was Darwin's creativity Darwinian? *Psychological Inquiry*, *10*, 338–340.

Goncalo, J. A., & Staw, B. M. (2006). Indididualism-collectism and group creativity. *Organizational Behavior and Human Decision Processes*, *100*, 96–109.

Hackman, J. R. (1992). Group influences on individuals in organizations. In: M. D. Dunnette & L. M. Hough (Eds), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 2, pp. 199–267). Palo Alto, CA: Consulting Psychologists Press.

Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment: Managing differentiation and integration*. Boston, MA: Graduate School of Business Administration, Harvard University.

Maier, N. R. (1970). *Problem-solving and creativity: In groups and individuals*. Belmont, CA: Brooks/Cole.

Mumford, M. D. (1999). Blind variation or selective variation: Evaluative elements in creative thought. *Psychological Inquiry*, *10*, 344–348.

Nemeth, C. J., & Staw, B. M. (1989). The tradeoffs of social control and innovation in small groups and organizations. In: L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 22, pp. 175–210). New York: Academic Press.

O'Reilly, C. A., & Chatman, J. (1996). Culture as social control: Corporations, culture and commitment. In: B. M. Staw & L. L. Cummings (Eds), *Research in Organizational Behavior* (Vol. 18, pp. 157–200). Greenwich, CN: JAI Press.

Simonton, D. K. (1999a). Creativity as blind variation and selective retention: Is the creative process Darwinian? *Psychological Inquiry*, *10*, 309–328.

Simonton, D. K. (1999b). *Origins of genius: Darwinian perspectives on creativity*. New York: Oxford University Press.

Staw, B. M. (1990). An evolutionary approach to creativity and innovation. In: M. W. West & J. L. Farr (Eds), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 287–308). New York: Wiley.

Staw, B. M. (1995). Why no one really wants creativity. In: C. M. Ford & D. A. Gioia (Eds), *Creative action in organizations: Ivory Tower visions & real world voices* (pp. 161–172). Thousand Oaks, CA: Sage.

Staw, B. M., & Epstein, L. (2000). What bandwagons bring: Effects of popular management techniques on corporate performance, reputation, and CEO pay. *Administrative Science Quarterly*, *45*, 523–556.

Sternberg, R. J. (1998). Cognitive mechanisms in human creativity: Is variation blind or sighted? *Journal of Creative Behavior*, *32*, 159–176.

Sutton, R. I., & Hargadon, A. (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, *41*, 685–718.

Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations*. London, UK: Wiley.