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A dynamic perspective on diverse teams: Moving from the dual-process model to a dynamic coordination-based model of diverse team performance

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Running Head: A Dynamic Perspective on Diverse Teams

A DYNAMIC PERSPECTIVE ON DIVERSE TEAMS:
MOVING FROM THE DUAL-PROCESS MODEL TO A DYNAMIC COORDINATION-
BASED MODEL OF DIVERSE TEAM PERFORMANCE

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ABSTRACT

The existing literature on diverse teams suggests that diversity is both helpful to teams in making more information available and encouraging creativity and damaging to teams in reducing cohesion and information sharing. Thus the extant literature suggests that diversity within teams is a double-edged sword that leads to both positive and negative effects simultaneously. This literature has not, however, fully embraced the increasing calls in the broader groups literature to take account of time in understanding how groups function (e.g., Cronin, Weingart, & Todorova, 2011). We review the literature on diverse teams employing this lens to develop a dynamic perspective that takes account of the timing and flow of diversity's effects. Our review suggests that diversity in groups has different short-term and long-term effects in ways that are not fully captured by the dominant double-edged sword metaphor. We identify an emerging perspective that suggests a *tropical depression* metaphor—that has the potential, over time, to develop either into a dangerous hurricane or diffuse into a rainstorm that gives way to sunshine, as more apt to capture the dynamic effects of diversity in teams. We conclude by outlining an agenda for redirecting future research on diverse teams using this more dynamic perspective.

A DYNAMIC PERSPECTIVE ON DIVERSE TEAMS: MOVING FROM THE DUAL-PROCESS MODEL TO A DYNAMIC COORDINATION-BASED MODEL OF DIVERSE TEAM PERFORMANCE

Why do some diverse teams outperform homogenous teams, while others severely underperform? At some point in the not-so-distant past that question may have provided an interesting thought experiment, but in an era of globalization and increased worker mobility it has moved to everyday reality for managers. Scholars have responded to this changed reality with an explosion of research on group diversity of all types and have generated significant insight into the drivers of diverse group performance (see Guzzo & Dickson, 1996; Harrison & Klein, 2007; Joshi & Roh, 2009; van Knippenberg & Schippers, 2007; Williams & O'Reilly, 1998). The metaphor that has emerged from the literature on diverse groups and teams is one of a “double-edged sword” (Milliken & Martins, 1996) whereby diversity leads simultaneously to informational advantage and to potential for creativity, as well as to reduced cohesion and poor information exchange. In line with recent calls for better understanding team dynamics over time (Cronin, Weingart and Todorova, 2011), in this paper, we review the literature on team diversity through a more dynamic, temporal lens to explain how diversity influences team performance. Our review reveals a different emergent metaphor that takes account of time in understanding why diverse teams produce diverse outcomes to replace the historic dual-process model.

By “diverse team” we mean a workgroup in which team members represent multiple identities or perspectives, as opposed to a group that contains members of a minority category. For example, we would consider a top management team composed entirely of women to be lower in diversity than a top management team composed half of women and half of men, despite the higher representation of a minority status category in the former. This is consistent with a very large literature on diverse teams, which has characterized the effects of team

diversity on performance as a double-edged sword. This metaphor has been hugely productive for scholarship on group diversity, and suggests that high-performing diverse groups result from a delicate balancing act between its positive and negative effects. It is, however a static model in the sense that it assumes that the positive and negative effects of diversity on team processes occur simultaneously rather than dynamically over time.

Recent literature on groups and teams emphasizes an urgent need for taking a dynamic and temporal approach to understanding group processes (see Cronin et al., 2011). In this paper we review the literature on diverse groups through a temporal lens to better understand the dynamics of how the effects of diversity might unfold over time. This emerging approach suggests that rather than a double-edged sword of simultaneous positive and negative effects, diversity produces initially positive effects that are often undermined over time by the fallout from coordination losses. Our review then suggests how the study of diverse teams might benefit from a different and more dynamic metaphor to replace the double-edged sword logic. We suggest the logic of a *tropical depression*—which may spiral into a hurricane or diffuse into a rainstorm that later gives way to the sun as it develops over time, depending on the environment in which it occurs. This metaphor is more in line with the recent emphasis on time in the broader groups and teams literature.

To untangle these temporal effects of group diversity, we compare studies of diverse teams working together over longer periods of time with a relatively more recent set of studies that examine teams interacting in the very early stages of formation. That review reveals three unexpected insights into diverse teams. First, it suggests that *coordination failure*—problems integrating a team’s informational resources that arise from unanticipated differences in perspectives or representational gaps (Cronin & Weingart, 2007; Huber & Lewis, 2010)—can

emerge in diverse groups and significantly influence subsequent group processes. Second, ineffective group processes typically attributed to social categorization often emerge only later as the group processes the effects of coordination failure. Third, surface-level or demographic diversity often triggers diverse teams to coordinate their informational resources and thus to prevent coordination failures and improve group performance in the longer term.

By combining our review of research on the performance consequences of group diversity with research on coordination processes in groups, we outline a future research agenda for diversity research that places more emphasis on understanding coordination processes in diverse groups. The literature we review suggests that coordination failures often trigger ineffective group processes, and that these ineffective processes get exacerbated over time unless the underlying coordination challenges are resolved. Our suggestions for future research build on the idea that coordination failure is the proximal challenge for diverse teams, as well as the key possible point of intervention for preventing diversity from leading to many of the negative outcomes typically associated with diverse teams such as poor cohesion and information sharing. We also suggest that coordination and social categorization processes are likely to interact in non-intuitive ways as they unfold over time, making it important to understand temporal processes in diverse groups. This new more dynamic *tropical depression* metaphor particularly highlights the need to elucidate the processes by which diverse teams integrate their informational advantage by identifying and managing their representational gaps, and the process by which social categorization leads to ineffective group interaction patterns. We sketch this emerging alternative and its implications in this paper.

The Current State of Research on Diverse Teams

The literature on the performance and social consequences of group diversity is large and complex, with many strands and perspectives. Reviewing every nuance of that literature is a mammoth task that has been recently undertaken by other scholars (e.g., Harrison & Klein, 2007; Joshi & Roh, 2009; van Knippenberg & Schippers, 2007). We focus our review here specifically on the group-level effects of diversity by applying a temporal lens to this literature. In doing so, we contribute to a more general drive in groups and teams research to better understand the way that group life unfolds over time (Ancona, Okhuysen, & Perlow, 2001; Cronin et al., 2011; Harrison et al., 2003; McGrath, 1984). Surveying the group diversity literature through that lens enables us to reassess the historic double-edged sword metaphor by highlighting recent studies that are inconsistent with that metaphor, revealing more dynamic processes for understanding diverse teams.

The Double-Edged Sword Metaphor: A Dual-Process Model of the Effects of Team Diversity

Research on diverse teams has revealed two opposing forces at work that influence performance in those groups. First, almost by definition, diverse teams have an information advantage in having more and multiple perspectives on the task at hand. Researchers have labeled this type of difference “deep-level diversity” (Harrison, Price, & Bell, 1998; Mannix & Neale, 2005; Phillips & Loyd, 2006). It is used to describe instances in which team members differ in the knowledge and perspectives that they bring to the group (Jehn, Northcraft, & Neale, 1999). Deep-level differences may arise from group members’ functional backgrounds (Bantel & Jackson, 1989), educational backgrounds (Wiersema & Bantel, 1993), task-relevant information (Phillips & Loyd, 2006), beliefs and attitudes (Harrison et al., 1998; Jehn et al., 1999), or even group member personalities (Harrison, Price, Gavin, & Florey, 2002). Those characteristics

produce differences in perspectives, values, or information, but they are not inherently hierarchical or indicative of status and therefore do not generally produce negative interpersonal processes (Harrison & Klein, 2007). Diverse teams have specifically been shown to be better at decision making and creativity than homogeneous teams because of their increased variety in the backgrounds, resources, information, and skills (e.g., Bantel & Jackson, 1989; Muira & Hida, 2004). Deep-level diversity is therefore associated with informational benefits for teams.

At the same time, however, group diversity has also been associated with a lack of cohesion and communication, increased conflict, and reduced motivation to engage with the team (e.g., Lau & Murnighan, 1998; Williams & O'Reilly, 1998)—factors that tend to undermine the team's information advantage. Scholars have argued that many of these negative effects occur because salient demographic differences between group members trigger categorization processes—whereby similar members identify with one another and differentiate themselves from those who fall outside of their social category (Tajfel, 1979)—and such categorization leads to decreased communication and increased conflict between sub-groups.

Demographic differences include nationality (Watson, Kumar, & Michaelson, 2003), group tenure (O'Reilly, Caldwell, & Barnett, 1989), organizational tenure (Pfeffer, 1983), and gender and race (Chatman, 2010). Those characteristics may be related to a group member's status—for example, older team members may have higher status than younger, newer members; men generally have higher status than women—and may therefore create a basis for conflict. Because these differences are generally visible to the group, scholars have labeled these “surface-level” diversity (Harrison et al., 1998; Phillips & Loyd, 2006), distinguishing them from informational or deep-level differences that are not immediately obvious. Visible characteristics provide a basis on which members can identify with similar others and distinguish themselves

from different others, leading to the negative consequences of social categorization (Williams & O'Reilly, 1998).

Taken together, diversity increases access to information, but at the same time groups do not process it effectively due to social cohesion problems among members. The diverse group literature implies that these two processes occur in teams simultaneously and immediately on group formation, as shown in Figure 1. From that view, the dominant metaphor for understanding diverse teams that has emerged is of a double-edged sword that cuts both ways for team performance—positively and negatively. Thus, it appears that effectively managing diverse teams comes from striking a fine balance between achieving the informational benefits without invoking the social cohesion costs.

INSERT FIGURE 1 HERE

Empirical research in real-world teams consistently finds that diversity, especially demographic diversity, is negatively associated with overall group performance (Harrison & Klein, 2007; Jackson, Joshi, & Erhardt, 2003; Williams & O'Reilly, 1998), suggesting that achieving this balance is extremely difficult in practice. Research to date indicates that on average, diverse teams typically perform worse than homogeneous teams, suggesting that the costs from social categorization processes are greater than the information benefits of diversity.

In an effort to understand how to achieve the balancing act implied by the dual-process model, scholars have taken one of two broad approaches to resolving the apparent trade-off between the informational benefits and cohesion challenges created by diversity. The first approach is to suggest that diverse teams can transcend social categorization processes by identifying moderators that help them to minimize social categorization processes while still allowing for information exchange. Moderators identified as effective include team members'

mind-sets toward diversity, team culture and norms, task structure, and leadership (e.g., Bezrukova, Jehn, Zanutto, & Thatcher, 2009; Chatman & Flynn, 2001; Earley & Mosakowski, 2000; Ely & Thomas, 1996; Gibson & Gibbs, 2006; Homan & Greer, 2013; Jehn & Bezrukova, 2004; Van der Vegt & Bunderson, 2005). The second approach to managing the diverse team paradox recognizes that the benefits and costs of group composition are associated with different types of diversity. Deep-level diversity (i.e., underlying differences in perspective) is associated with information benefits, whereas surface-level diversity (i.e., differences in salient characteristics) is associated with the losses from social categorization processes. Therefore, diversity can be managed by composing teams around deep-level, rather than surface-level, diversity (Phillips & Loyd, 2006; Shin, Kim, Lee, & Bian, 2012).

Concerns about the Dual-Process Model of Diverse Teams

There are at least three interrelated reasons to be skeptical of the efficacy of either of the above approaches for managing the balance between the benefits of informational diversity and the costs of social categorization. The first is a direct challenge to the notion that social categorization can ever be effectively overcome in a way that allows for the benefits of informational diversity to take primary stage. Existing individual-level diversity research suggests that categorization based on demographic differences happens rapidly, often unconsciously, and relatively effortlessly (Greenwald & Banaji, 1995; Ito & Urland, 2003). More directly, once we assume that categorization will occur, the solution for overcoming social categorization requires building a super-ordinate group identity by focusing on what group members have in common rather than on what makes them unique (Chatman, Polzer, Barsade, & Neale, 1998) or developing a shared set of norms and perceptions within the team (Earley & Mosakowski, 2000). Whereas those interventions improve interpersonal processes and

consequently group outcomes, especially cohesion, they may also reduce the benefits of deep-level diversity, by deemphasizing the differences between team members and discouraging members from sharing unique information. Moreover, a handful of studies demonstrate that attempts to suppress sub-group identification can create additional group cohesion challenges by overlooking the existence of genuine distinctiveness between sub-groups (Hornsey & Hogg, 2000; Huo, 2003; Huo, Molina, Sawahata, & Deang, 2005). Thus, the empirical evidence from working directly to reduce social categorization processes suggests that doing so may simultaneously reduce informational benefits from deep-level diversity, or may be ineffective in cases where it heightens the social categorization risks of surface-level diversity.

A second reason to be skeptical of the efficacy of the dual-process model is that alternatives have been suggested for the underlying mechanisms in the model. In particular, the social categorization and identity processes presumed to create negative performance effects in diverse teams are rarely directly tested in empirical research. As Van Knippenberg and Schippers (2007, p. 526) write in their review, “Surprisingly few studies, however, directly assessed social categorization processes, and results are inconsistent enough to raise doubts about the extent to which social categorization processes are in operation. Moreover, without supporting process evidence, some of the negative relationships between diversity and group process may also be interpreted as reflecting the consequences of misunderstanding and disagreement per se (i.e., a more dysfunctional side of information/decision making processes) rather than social categorization.” This is a specific challenge to the dual-process model that questions the strength of effects caused directly through social categorization and suggests other psychological processes may be at work.

The third reason to question the efficacy of the double-edged sword metaphor is related to questions raised about the effectiveness of trying to reduce social categorization by composing teams to maximize deep-level diversity while minimizing surface-level diversity. In practice this is extremely difficult at best because deep-level and surface-level diversity co-vary significantly in real teams. Oftentimes it is an individual's very demographic category that leads to the different experiences and perspectives that are so valuable for informational or deep-level diversity (Anteby & Anderson, 2014; Gilligan, 1982). For example, older workers are more likely to rely on their greater experience to gauge practical feasibility of ideas generated by the group, and women and men are likely to have different but complementary perspectives on many tasks, such as how households make purchasing decisions. In addition, research has shown that it is rarely obvious what surface-level characteristic will be salient to members as a basis for categorization. Van Knippenberg, De Dreu, and Homan (2004) suggest that salience will depend on an interaction between the cognitive accessibility of a category, the similarity of members within a category in the group relative to the difference between members of other categories, and the match between category members' beliefs and values, all of which, we note, may change with time or group tenure. Thus, attempting to reduce social categorization (i.e., increase cohesion) in diverse groups by constructing groups that have deep-level diversity and surface-level similarity is conceptually difficult and often well-nigh impossible in practice.

The problems of constructing groups for deep-level diversity are demonstrated through a number of studies on fault lines in groups. For example, Sawyer, Houlette, and Yeagley (2006) compared informationally diverse decision-making groups that were ethnically homogeneous with groups that had an ethnic minority member present who was either also in the informational minority (i.e., a fault line) or in the informational majority (i.e., crosscutting informational and

ethnic diversity), and reported that groups with crosscutting dimensions of diversity outperformed homogeneous and fault-line groups. That type of cross-categorization leads to more favourable group processes than does a fault line dividing the group equally (Homan & van Knippenberg, 2003; Phillips, Mannix, Neale, & Gruenfeld, 2004). It is, however, extremely difficult in practice to engineer group composition to not involve fault lines, given the many other demands on team composition. For example, if a U.S.-based company wishes to introduce a new product in China, faultlines based on country, ethnicity, and function are virtually impossible to avoid.

In sum, there are serious questions within the diverse teams literature about the dominant dual-process model, and about how the psychological processes in diverse teams work. Existing research findings strongly suggest that we are yet to fully understand how to manage the cohesion disadvantage associated with diverse teams without jeopardizing the informational advantage. For these theoretical and practical reasons, scholars who study diverse teams have started to think about different possibilities for resolving the diverse group paradox, one of which is to understand the dynamics of how diverse teams work.

Recently teams' scholars have emphasized the importance of developing more time-sensitive and dynamic approaches to group phenomena. The dynamic properties of teams, and specifically the dynamic effects of diversity on team outcomes have to date received relatively little research attention (Cronin et al., 2011). In current empirical work, social categorization, information sharing, creativity, and performance are typically captured by aggregate variables measured after the group has interacted for some time. As a result, we cannot eliminate the possibility that, rather than diversity within teams acting as a double-edged sword that produces both positive and negative effects simultaneously, one of these mediators precedes or even

causes the other. Given the increasingly unbounded and dynamic nature of teams (Edmondson & Schein, 2012; Wageman, Gardner, & Mortensen, 2012), this is an important possibility. We therefore suggest a need to reassess the double-edged sword metaphor and explore the more dynamic and time-sensitive group processes associated with diverse groups.

A Dynamic Perspective on Team Process

The study of team processes is being revitalized by researchers' recent efforts to develop a more dynamic view of group functioning that accounts for the way that group life unfolds over time (Ancona et al., 2001; Cronin et al., 2011; Harrison et al., 2003; McGrath, 1984). We first describe what we mean by that dynamic perspective, drawing on the broader groups and teams literature. We then apply the dynamic perspective to the diverse teams literature.

Historically, research on group processes has relied on aggregate survey-based measures to assess processes like conflict, participation, and identification. Those aggregated measures are presumed to capture constructs that emerge from interactions between team members and between the team and the environment (Morgeson & Hofmann, 1999). However, the interactions underlying an emergent construct, such as conflict or cohesion, may not be obvious based on the construct itself and a variety of different types of interactions may contribute to the higher-level construct (Cronin et al., 2011; Klein & Kozlowski, 2000). The interactions that constitute emergent constructs have received limited research attention to date (Harvey & Kou, 2013; Paletz, Schunn, & Kim, 2011; Wageman, Fischer, & Hackman, 2009). In order to understand group dynamics, research must examine those micro-psychological processes as they unfold over time and the way that they occur within ongoing interactions. That analysis will provide a basis for models that explain how micro-processes aggregate into well-established emergent constructs over time.

Examining ongoing interactions and the specific team member behaviors situated within them is critical to understanding group processes because those short-term behaviors can reveal different dynamics than aggregated measures (Arrow, McGrath, & Berdhal, 2000; Cronin et al., 2011; Paletz et al., 2011). For example, although relationship conflict measured as an aggregate variable has been found to negatively predict task outcomes at the group level (de Witt, Greer, & Jehn, 2012), analysis of group interaction reveals that groups can encounter many small dyadic conflicts that are quickly defused and do not degenerate into the kind of broader negative interpersonal environment that is associated with the aggregated measure of relationship conflict in the literature (Paletz et al., 2011). Similarly, whereas a process in which all group members are involved in evaluating a set of creative ideas may produce a negative environment for idea generation in creative groups, examining the micro-processes of the collective creative process reveals many instances of evaluative behavior that enhance and in fact are important for group creativity (Harvey & Kou, 2013). As these examples suggest, measuring variables in the short term based on group member behaviors may reveal different underlying interactions than are expected based on aggregated measures (cf. Peterson, Owens, & Martorana, 1999). In both cases, switching from one level of analysis to another fundamentally changes the effect of the construct (i.e., relationship conflict, idea evaluation) on group outcomes—the aggregated variables have negative consequences for group outcomes, whereas many micro-behaviors are benign or even beneficial for groups. Therefore, examining micro-behaviors is likely to reveal new insights into group dynamics.

A second, interrelated reason why examining behaviors situated within group interactions in the short term is critical to understanding group dynamics is that the dichotomy between the effects at the different levels of analysis reveals the possibility that new, previously unexplored,

processes exist to explain how micro-behaviors aggregate in the longer term. In the previous example, Paletz et al. (2011) suggest that process loss may be responsible for the negative effects of conflict on team performance, rather than exclusively negative affect (i.e., social categorization). Similarly, there may be a balance of idea evaluation activity with idea generation activity that, once tipped, turns the relationship between idea evaluation and group creativity from positive to negative. By examining the micro-processes that evolve in groups over time, Peterson & Behfar (2003) found that negative performance feedback can be a cause of group conflict, not just an outcome of group conflict, uncovering a new, previously unexplored link between feedback and conflict and inverting the nature of the expected relationship. Exploring micro-behaviors can therefore help us to refine our understanding of aggregated constructs in the existing group literature.

A third reason for examining micro-processes over time is that effects measured over a relatively longer period of time may not capture some variables that only occur in the short term, and can be uncovered only by studying the short-term micro-processes. Those variables may intervene between dependent and independent variables in a study, yet remain invisible in an aggregated study (Mitchell & James, 2001). For example, whereas group diversity has been associated with beneficial task outcomes, intervening processes like information elaboration are the causal mediators of those outcomes. To develop a complete understanding of any group process, it is therefore necessary to consider both the way that the process is reflected in a generalized group environment over some period of time, and the specific group member behaviors that create that environment in the shorter term. That requires explicit attention to the temporal horizon over which effects are measured.

Applying the Dynamic Perspective to Existing Research on Diverse Teams

A relatively small but growing number of studies in the team diversity literature have begun to incorporate time as an explicit variable in their models of diverse team performance. This research has demonstrated that the effects of both surface and deep-level diversity are different over different time frames than studies typically allow for (Harrison et al., 1988; Harrison et al., 2002; Harrison et al, 2003; Pelled, Eisenhardt, & Xin, 1999). In particular, those studies reveal that over time, the negative effects of surface-level diversity can be attenuated, whereas the positive effects of deep-level differences may reduce in highly collaborative groups. Those findings hint at the possibility that both the negative consequences of social categorization processes and the positive consequences of informational diversity may be exaggerated in the existing literature; or that the relationship between those constructs is not yet fully understood.

Diversity scholars have yet to develop a dynamic perspective on the dual-process model explaining how the benefits from informational diversity and problems stemming from demographic diversity may *relate to one another* over time. We suggest that the next step to developing a better understanding of diverse teams performance is to examine teams through a temporal lens. Specifically, we propose comparing studies conducted over longer periods of group work with those that capture more micro-interactions that occur in the very early period of group interaction. The model illustrated in Figure 1, in which diversity acts as a double-edged sword, is based on and supported by studies that examine the effects of diversity over relatively long periods (i.e., weeks and months). When a shorter time frame is considered in studies of diverse groups, however, different interpersonal and informational group processes have been observed. We review long-term and short-term studies below. In so doing, we reveal an

emerging alternative understanding of the effects of group diversity—in particular based on studies of more micro-group processes occurring in the very early stages of group interactions.

Applying the dynamic perspective as a lens for reviewing existing studies of diverse teams reveals new insights into how group composition influences group processes and outcomes through the three mechanisms proposed above: (a) by exposing new relationships between group diversity constructs and outcomes, (b) by deepening our understanding of existing constructs, or (c) by revealing entirely new constructs.

Long-term studies using aggregated measures

The majority of empirical studies that underlie the dual-process model of team diversity measure diversity's effects at one point in time after a relatively long period of group interaction. By long term, we mean those studies that use aggregate measures to capture the general group environment resulting from the process of information use and interpersonal interaction over weeks and months, rather than examining detailed micro-processes and group member behaviors (see Table 1 for examples of studies that fall into this category). Most studies in this category measure diversity's effects after several months of interaction between members of intact organizational teams; many studies include teams with tenures of six months or more. However, these studies typically do not directly measure the mediating micro-processes that give rise to these effects of diversity. For example, the amount of conflict in a diverse versus a homogeneous group may be measured after six months of interaction by aggregating group members' individual perceptions of the amount of interpersonal friction and task-based disagreement among group members. That measure, however, does not capture other factors, such as whether small conflicts occur frequently or large conflicts erupt periodically, or whether conflicts involve the entire team versus just a few group members.

Findings from studies that focus on the relatively long term support the double-edged sword metaphor—that is, diversity improves information available in teams but also creates interpersonal friction between team members. As a result, in these studies diversity often exhibits small or no effects on group performance (van Knippenberg & Schippers, 2007). However, these studies face two specific challenges with regards to the dual-process model: unclear causality and conflicting findings, which we review in detail below.

INSERT TABLE 1 ABOUT HERE

Unclear causality for the emergence of ineffective group processes in diverse groups. A key proposition of the dual-process model is that diverse teams face a major challenge in managing interpersonal interactions in order to prevent social categorization processes from causing ineffective group processes, such as conflict, lack of cohesion, and lack of trust. Because the model is derived largely from examining teams who have worked together over a relatively long period of time, we know from empirical research that ineffective group processes do tend to emerge in diverse teams over time. However, the specific causes for the emergence of these ineffective group processes remain unclear.

Studies that support the double-edged sword metaphor tend to follow one of two approaches to modeling the relationships between diversity, information effects, group process effects, and performance. The first approach is to focus on only one edge of the sword by specifying links between type of diversity and its predicted effects. For example, Bantel and Jackson (1989) focused on the relationship between functional and educational diversity and innovation, which is expected to be mediated by informational effects, whereas Lau and Murnighan's (1988) theory focused on faultlines based on demographic characteristics and the attendant consequences for group processes.

A second approach is to consider moderators of the diversity performance relationship that may operate on one or both edges of the sword. Often these studies measure only a final performance outcome variable and the moderator, without examining the hypothesized mediating processes of information elaboration or social categorization. For example, Nishii and Mayer (2009) demonstrated that the positive effect of demographic diversity on a team's turnover is moderated by leader-member exchange, and Jehn and Bezrukova (2004) found that functional diversity had a positive effect on performance in organizations with a people-oriented culture. Similarly, theories that draw on conflict to explain the effects of diversity in teams often provide models that include both task conflict as the source of informational effects and relationship conflict as the source of group process losses (Choi & Sy, 2010; Pelled et al., 1999). However, those studies measure the consequences (i.e., different kinds of conflict), rather than their causes (i.e., information elaboration or social categorization).

It is noteworthy that very few studies actually measure the mediators that are theorized to underlie the effects of diversity on performance. A few studies measure information elaboration as the mediating variable for the positive effects of diversity. For example, Van der Vegt and Bunderson (2005) include learning and Kearney, Gebert, and Voelpel (2009) include information elaboration as mediators of the team diversity-performance relationship. In contrast, the mechanisms through which negative group processes are expected to occur—social identity and social categorization—are rarely explicitly tested. When negative interpersonal group outcomes, like relationship conflict, increased turnover, or low trust are found, they are theoretically linked to those mechanisms rather than explicitly measured. Similarly, when moderators such as group identification are supported, they are theoretically expected to operate by enabling group members to overcome identification with sub-groups without actually measuring identification.

For example, a low level of affective commitment toward the group (e.g. Kearney et al., 2009; Van der Vegt & Bunderson, 2005) is assumed to indicate that social categorization processes are in operation, but these processes themselves are not measured.

The problem with these empirical approaches is that factors other than categorization and identification processes could be intervening between diversity and group process outcomes such as relationship conflict or group identification. This possibility is especially important in the studies in this category, since they typically examine ongoing groups with relatively long tenures. When measures are taken after several weeks or months of interaction between group members, studies may fail to identify intervening processes that only occur in the early stages of interaction, as has been shown in micro-time scale studies in the broader groups and teams literature, such as on conflict and creativity. This suggests the possibility that the double-edged sword model may not fully capture diversity's effects, particularly at early stages of group interaction.

In sum, though many studies are supportive of the double-edged sword model, their empirical design does not allow us to precisely nail down the two mechanisms that the model proposes to underlie the effects of diversity on performance—especially of diversity immediately leading to social categorization and ineffective interpersonal group processes.

Findings that challenge the dual-process model. Despite strong support for the double-edge sword model of diverse teams, there are many studies over the longer term using aggregated measures that directly challenge the underlying mechanisms in the dual-process model. These findings challenge the hypothesized beneficial effects of informational processes as well as the deleterious effects of social categorization processes.

One surprising set of findings is that informational diversity alone (i.e., after controlling for demographic diversity) can produce poor performance. For example, Van der Vegt and Bunderson (2005) found that teams diverse in deep-level informational characteristics like expertise have better performance only when group members identify strongly with the team; otherwise they have poor performance. One explanation for this surprising finding, which is contradictory to the dual-process model, is that deep-level differences are often accompanied by surface-level differences, which may create unintended interpersonal effects (Harrison & Klein, 2007)—for example, some areas of expertise may also be more highly valued on the team and therefore create a rank ordering of members based on their functional or educational background. Even groups that have no surface-level differences may have poor performance because group members may categorize by diversity in values and beliefs such as political affiliation (Jehn et al., 1999). In other words, even when a team's diversity stems from characteristics expected to produce primarily informational differences, they often have poor performance, and the typical causal explanation provided in these studies for these negative effects are rooted in some form of social categorization, which is left unmeasured.

Intriguingly, a small number of studies that examine student groups working on ongoing class projects over several weeks suggest that groups with information diversity may suffer from poor performance because of lack of coordination, rather than because of social categorization processes. By examining student teams these studies have been able to capture information use on a more micro-scale by examining group outputs in detail or by taking measurements at different points in time. First, as expected from the dual-process model, these studies find that diverse groups benefit from possessing and sharing different information. However, these groups are also less likely to integrate their diverse information in forming solutions, thereby not truly

taking advantage of their diverse informational resources. For example, Dahlin, Weingart, and Hinds (2005) counted the number of pieces of unique information shared by group members and found that student groups working together over a seven-week period who were diverse in educational background shared more information and discussed that information in greater depth than groups with less diversity. However, those groups also integrated less of their information to form solutions, suggesting that deep-level diversity makes it difficult for groups to coordinate information. Moreover, Van der Vegt, Bunderson, and Oosterhof (2006) found that student teams with high levels of diversity in expertise had asymmetric patterns of helping, such that members were more willing to help those they perceived as more expert. Taken together, these studies suggest that information is not always efficiently coordinated in diverse groups. Supporting this specific conclusion, Klein, Knight, Ziegert, Lim, and Saltz (2011) found that diversity has a more positive effect on team outcomes in the presence of moderators that aid coordination, as opposed to moderators that decrease negative interpersonal processes such as low cohesion. The studies on the informational benefits of deep-level diversity have not always detected the information coordination issues faced by diverse groups since often they focus on tasks in which no coordination between group members is required (Harvey, 2013).

In sum, our review suggests that it is currently unclear whether social categorization is at the root of performance problems in diverse groups because the majority of studies to date have taken measures over relatively long time scales and made theoretical assumptions about how the intervening process led to longer-term outcomes. Our review also suggests that the negative effects of diversity may also be caused by failures to coordinate due to the complexity of managing diverse information. To delve further into the roles of information and coordination

versus social and interpersonal processes in diverse groups over time, we turn now to examining studies of diversity conducted over shorter time spans.

Short-term studies of newly formed diverse groups

Studies that measure diversity in the short term by studying newly formed experimental groups that interact over a matter of minutes or hours, or by taking very precise measures of behavior during group interactions, paint a different picture of the role of informational and social processes than studies that take place over weeks and months. Our review of these studies suggests that informational diversity can lead to coordination problems in the short term. These studies suggest that, rather than harming group processes and outcomes, surface-level diversity can actually *improve* information use and team performance at early stages, particularly when group members are open to diversity. Our review suggests that the ineffective interpersonal processes that have been attributed to social categorization actually emerge later in the group tenure, *after* the group has experienced coordination problems. This inverts the dual-process model suggestion that groups need to prevent interpersonal problems from destroying the benefits of informational diversity; rather, groups may actually need to prevent information coordination problems from destroying members' interpersonal relationships. We review short-term studies in detail below to explore this idea.

Problems coordinating information in groups with deep-level diversity. One set of studies examines actual information use during group interaction in the short term to demonstrate that diversity within groups makes it difficult for them to coordinate information effectively. Dahlin et al.'s (2005) study used this approach of coding the information used in group outputs to demonstrate that diverse groups used more information, but integrated that information less. In a study of student teams with detailed measures of information processes, Fisher, Bell, Dierdorff,

and Belohlav (2012) found that teams without shared mental models (i.e., those with a diversity of perspectives on the group task or deep-level diversity) engaged in less implicit coordination of information, meaning members were less proactive in requesting information, work sharing, or adapting their behaviors in response to other's work. Similarly, Harvey (2013) demonstrated that groups with diversity based on differences in task perspective engaged in less elaboration and integration of ideas during group discussion and were less likely to produce creative output that integrated group members' ideas, relative to groups without such deep-level diversity.

Research suggests that deep-level diversity produces representational gaps, which make it difficult for team members to integrate their information and knowledge and complete a task, especially in the short term, even if they are motivated to do so (Cronin & Weingart, 2007; Heath & Staudenmayer, 2000; Huber & Lewis, 2010). Representational gaps are inconsistencies in the way that different members of the team understand the task (Cronin & Weingart, 2007), which arise due to deep-level differences in knowledge and expertise. For example, team members with different functional backgrounds will have a significant stock of non-overlapping and path-dependent expertise that they cannot easily transfer to one another (Bunderson & Sutcliffe, 2002). Heath and Staudenmayer (2000) argue that specialists often do not communicate their unique information because they do not realize how it may be useful to other members, and frequently do not even realize that other members may not possess this information. Dougherty (1992) found that functional specialists often occupy different "thought worlds," with completely different presumptions and ideas about the task, which they often do not communicate. In addition, even when specialists communicate, it does not result in shared understanding, because they often do not share the underlying beliefs, values, and assumptions that are part of their

specialization. Therefore, even after attempts at communication, differences in interpretation or representational gaps oftentimes remain (Cronin & Weingart, 2007).

Aiding coordination can help diverse teams to overcome problems with elaborating and integrating information. For example, effective leadership that involves the ongoing coordination of activities like keeping the group on schedule and ensuring there is enough time for task completion moderates the negative effects of temporal diversity (Mohammed & Nadkarni, 2011). Homan, van Knippenberg, Van Kleef, and De Dreu (2007) coded the discussions of experimental groups to reveal that informational diversity was only associated with increased elaboration of information in groups when members valued diversity. The benefits of informational diversity were not automatic—they relied on whether group members searched for new information and listened to others' views. Rico, Sánchez-Manzanares, Antino, and Lau (2012) demonstrated that when diverse team members did not have aligned roles on the task, they performed better when a superordinate goal facilitated coordination across sub-groups than when sub-groups had specific goals. Taken together, this set of studies suggests that groups experience difficulty utilizing deep-level diversity effectively in the short term.

How surface-level diversity aids information coordination. A second set of studies demonstrates that surface-level differences do not always lead to negative outcomes, and that they can actually facilitate information coordination. Surface-level differences do not necessarily reduce social integration in highly interdependent groups (Guillaume, Brodbeck, & Riketta, 2012). Visible surface-level differences, because they are perceived by group members, tend to act as signals for the need to coordinate because other group members may have different information, ideas, or goals (Rink & Ellemers, 2006). Cultural (Nederveen Pieterse, van Knippenberg, & van Dierendonck, 2013), racial (Phillips & Loyd, 2006), gender (Rico et al.,

2012), and subjective social category (Meyer, Shemla, & Schermuly, 2011) diversity have all been associated with greater informational elaboration in groups. A number of studies have shown that particularly in the micro-time scale, groups with surface-level diversity had more task engagement, shared more information, and expressed more dissenting opinions (see Phillips et al., 2004; Loyd, Wang, Phillips, & Lount, Jr., 2013; Rink & Ellemers, 2006). These findings suggest that demographic differences have the potential to actually *reduce* information coordination problems in groups with deep-level diversity.

Importantly, studies conducted over the short term also suggest that the signaling role of surface-level differences is critical to effective group processes. In groups with informational diversity, but not demographic diversity, interpersonal problems can develop when this deep-level diversity is not recognized. People expect others who are similar to themselves in terms of salient surface-level characteristics to share their perspectives and opinions, and they react negatively when this is not the case (Phillips, 2003; Phillips & Loyd, 2006; Rink & Ellemers, 2007a). Sub-groups can form over time as a result of conflict, which reduces the perception of similarity between team members (Zellmer-Bruhn, Mahoney, Bhappu, & Salvador, 2008).

In contrast, surface-level differences can be a signal that deep-level differences between team members exist, creating an expectation that there will be differences of information or opinion (Phillips et al., 2004) and a sense of congruence about norms and interpersonal relations in the team (Phillips, 2003; Rink & Ellemers, 2007b). Surface-level diversity can allow individuals to focus less on their interpersonal relationships and more on the task at hand (Loyd et al., 2013). It can also act as a signal to underlying differences, creating an expectation that group members will disagree and lessening the impact of that disagreement when it occurs (Rink & Ellemers, 2007a). This can lead group members who have a strong racial identity, for

example, to exhibit more active communication behaviour during initial interactions with diverse groups in order to avoid potential misunderstandings (Stewart & Garcia-Prieto, 2008).

In sum, in the short term, demographic differences can help teams to coordinate diverse information by triggering the need for group members to anticipate informational differences. This does not deny the existence and importance of social categorization processes, which have been long established in the social psychology literature (Bodenhausen, Kang, & Peery, 2012). Rather, we suggest that the cognitive process of categorizing group members need not automatically lead to ineffective group processes such as poor communication and less trust with members of different categories. Instead, those differences may lead to attempts to adjust communication to help overcome representational gaps. This seems particularly likely as the workforce becomes increasingly diverse and attitudes toward demographically different others has and continues to improve over time (e.g., Bobo, Charles, Krysan, & Simmons, 2012). However, that more positive process is still unlikely to occur in every case, such as when social category differences create clearly divisible sub-groups (Lau & Murnighan, 1998); or when social category differences are so low in salience that they do not fulfil a signaling function (Stewart & Garcia-Prieto, 2008); or when group members choose to ignore social category differences (Rattan & Ambady, 2013).

Summary of the Dynamic Perspective on Team Diversity Research

Our review of studies of diversity's effects over the long term versus the short term through the emerging, more dynamic lens to studying teams reveals three key insights that are contrary to the dual-process model. First, although teams are inclined to use diverse information in the short term, they are less effective at integrating these resources, and therefore are more likely to encounter coordination failures and associated performance losses. Second, interpersonal

problems tend to emerge in the medium-long term as diverse teams interact. In fact, social categorization and identity processes do not necessarily lead to immediate negative interpersonal processes in diverse groups (i.e., recall that our review assumes zero-levels of negative initial perception about outgroup members). Third, surface-level differences can actually have the counterintuitive effect of aiding group process and integrating informational resources in the short term because the visual perception of differences between group members creates an expectation that deep-level differences are present, which triggers attempts to coordinate.

The combined evidence from the short-term and long-term studies strongly suggests the presence of intervening short-term variables that are inconsistent with the dual-process model, despite long-term effects being largely consistent with the dual-process model. In the following section, we explore the implications of those three insights and propose some new research directions for understanding diverse teams based on our dynamic perspective.

Toward a More Dynamic Perspective on Performance in Diverse Teams

The insights from reviewing the literature through a dynamic perspective suggest an emerging alternative to the dual-process model. Specifically, in the very early stages of group interaction, surface-level demographic differences can trigger better information sharing in groups, whereas deep informational differences are not seen and thus do not trigger the need to coordinate and thus are likely to be associated with ineffective processes. It suggests the possibility that the negative interpersonal effects of diversity that have been found in studies over longer periods actually develop over time and perhaps only *after* a group experiences some task-related hurdle such as coordination difficulties, rather than in immediate response to social categorization.

Whereas the predicted long-term effects of diversity we have reviewed in the literature mirror those found when measures of group processes and performance are taken after several

weeks, or months of interaction, the short-term effects do not. This leaves open the question of why negative interpersonal processes emerge over time in diverse groups, when they are oftentimes not present in the short term—suggesting the need for a new explanation of both the short- and long-term effects of diversity in groups.

In an attempt to answer that question, we draw on research on coordination in groups. Field studies of diverse groups that are composed of different specialists suggest that groups in general suffer from “coordination neglect” (Heath & Staudenmayer, 2000; Wageman, 1995), and that group members likely misattribute these to interpersonal (or motivational) issues rather than to underlying coordination challenges (Wageman, 1995; Armstrong & Cole, 2002). Such misattributions may cause interpersonal problems among group members in the longer term, leading to ineffective group processes and poor group performance outcomes, which in turn prevent groups from bridging representational gaps. These aspects are not yet incorporated into a theory of diverse teams. Integrating these insights reveals a plausible dynamic model in which coordination failures and their misattribution to motivational factors as intervening variables that mediate the relationship between the short-term and long-term effects of diversity. We summarize the emerging model in Figure 2, and describe how it provides a dynamic view of team diversity in detail below.

INSERT FIGURE 2 ABOUT HERE

Coordination failures can trigger a self-reinforcing cycle of ineffective group interactions and poor group performance (i.e., a tropical depression developing into a hurricane). When coordination failures are misattributed to motivational factors they can activate latent social categorizations as team members blame the failures on others’ personal characteristics, rather than representational gaps. Those social categorization processes then lead to poor group

performance as hypothesized in previous research. Over the long term, groups can get stuck in a spiral of increasing interpersonal hostility when coordination failures are misattributed as unwillingness to cooperate, and group members then retaliate by withholding information or by going it alone. In this way, minor problems can escalate into major conflicts, creating a vicious spiral of ineffective information handling, negative affect, and poor performance. In other words, social-categorization and interpersonal hostility in diverse groups is a plausible consequence rather than the cause of ineffective information handling (cf. Peterson & Behfar, 2003). Alternatively, groups can transcend their divisions and increase performance if they effectively manage informational differences to circumvent negative interpersonal processes (i.e., a tropical depression diffusing into a rainstorm).

These coordination issues can be traced to the presence of deep-level diversity in the group. On one hand, high levels of surface-level diversity and the resulting social categorization processes can reduce the likelihood of coordination failures and result in more effective group processes by signaling the presence of deep-level differences and the need for coordination, thereby generating a positive spiral of greater information sharing. On the other hand, when groups do not recognize the need to coordinate and do not overcome coordination failures, the presence of surface-level diversity can result in a negative spiral, because social category differences provide a convenient basis on which to allocate blame, creating divisions between group members or sub-groups (cf. Behfar, Peterson, Mannix, & Trochim, 2008, on conflict resolution and allocation of blame within the team). In sum, in a dynamic model, surface-level diversity can accentuate both the positive and the negative aspects of deep-level diversity.

Our review of research to date suggests that scholars may have underestimated the importance of coordination failures that arise from informational diversity as a source of poor

performance in diverse groups, and overestimated the negative effects of social categorization processes in groups. Both the double-edged sword metaphor and the emerging dynamic perspective lead to the same outcomes in the longer term over which most studies have actually measured performance consequences in diverse groups. However, the theoretical logic underlying these effects differs, and the dynamic perspective is more congruent with the demonstrated short-term effects of diversity that we have reviewed.

The dynamic theoretical perspective suggests that even in groups that start with high levels of communication, accidental coordination failures can trigger latent social identification processes, which, when misidentified as cooperation failures, result in poor interpersonal relations between group members such as lower communication, low trust, and high conflict. Specifically, coordination failures may act as triggers for underlying social categorization processes to manifest. In other words, the causality implied in typical explanations of diverse group performance may actually be reversed. Rather than interpersonal problems leading to decreased coordination, which in turn causes lower performance, recent research suggests that coordination failures lead to interpersonal problems that further disrupt group process and ultimately reduce group performance. Whether this spiral gets initiated determines whether the diverse team performance spirals up or down over time. This perspective takes account of the existing evidence we have reviewed from short- and long-term empirical studies of group performance in diverse teams. Rather than a double-edged sword, the dynamic perspective suggests that diversity acts more like a tropical depression that has the potential to spiral into a hurricane or diffuse into rain that eventually gives way to the sun as it develops over time, depending on the environment in which it occurs.

This dynamic perspective also reveals an alternative form for the relationships between types of group diversity (i.e., surface- and deep-level diversity), informational and social categorization mediators, and group performance, deepening our understanding of those constructs. It suggests coordination failure as the intervening mechanism to explain those relationships. Based on the field studies of teams with significant informational diversity, it is plausible that coordination failure intervenes before the informational and social consequences we normally observe in diverse groups, but has remained invisible to date because studies have rarely considered interactions that occur early in the group's life (cf. Mitchell & James, 2001). Rather than simultaneous effects from informational and social categorization processes, the emerging perspective suggests that group diversity produces informational processes, which can then become misattributed to negative interpersonal processes as shown in Figure 2.

Implications and Future Research Directions of a Dynamic Model

There are at least three broad implications for future research on diverse teams, as well as a number of specific research directions and questions that arise from this emerging metaphor of diverse teams as a tropical depression.

Implications from the Dynamic Perspective

The first implication for future research in diverse teams is for team diversity scholars to refocus their search for the psychological effects of diversity, as well as possible points of intervention. By applying the temporal perspective, we uncovered coordination failure as a new and more proximal mechanism through which diversity influences group life. That insight deepens our understanding of the primary constructs of deep-level and surface-level diversity. Rather than deep-level diversity solely providing a source of informational benefit to groups (van Knippenberg & Schippers, 2007), in the new perspective it also provides a source of problematic

group processes. In contrast, rather than social categorization that results from surface-level diversity being primarily responsible for ineffective group processes (Williams & O'Reilly, 1998), the dynamic perspective suggests that surface-level diversity has the potential to actually improve team coordination. Finally, this deeper understanding reveals a new relationship between the constructs themselves. Whereas previous research has conceptualized deep-level and surface-level diversity as exerting their influences simultaneously, the emerging perspective proposes a temporal ordering to those processes—so rather than seeing surface-level diversity as a reality to be managed, it can be seen as a source of advantage compared with groups of only deep-level diversity.

Moreover, the dynamic perspective reverses the idea that social categorization causes interpersonal issues in groups and suggests instead that, in some cases, interpersonal issues arise only later in the group process. Rather, informational processes, which are widely seen as an exclusively positive influence on group performance, may actually exacerbate or even trigger the negative consequences of social categorization processes. This draws attention to the emerging research on the conditions under which demographic differences can actually benefit groups (e.g., Phillips & Loyd, 2006). Given the growing need to manage diversity of all types in practice, the emerging perspective presents an exciting possible direction for further research.

A second implication for future research on diverse teams is for the growing body of scholarship on how knowledge is integrated in teams (Faraj & Sproull, 2000; Gardner, Gino, & Staats, 2012; Okhuysen & Eisenhardt, 2002). This emerging perspective shifts the focus from understanding how diverse groups access information to how they integrate their informational resources and transcend representational gaps to effectively perform their tasks. This emerging perspective also highlights how deep-level diversity makes the integration of information more

challenging (Dahlin et al., 2005; Harvey, 2013), in contrast to the dominant view that diversity should benefit information elaboration processes in a way that is automatically expected to result in more complex and integrated solutions. One implication is that since integration problems and misattribution of the causes behind these integration problems are at the heart of diverse group processes in the tropical depression model, solutions that alleviate poor integration and prevent misattribution are likely to be more effective for facilitating diverse group performance than the identity-based interventions that are currently typically proposed by diversity scholars. We argue here that integration-focused solutions enable group members to retain their unique perspectives and identities, but also effectively integrate them into superior solutions. Managerial prescriptions based on the emerging perspective therefore provide an opportunity to reconcile the conflicting effects of diversity by ameliorating interpersonal challenges before they arise, without compromising the information benefits of diversity.

The dynamic perspective also suggests that as diversity researchers we need to rethink what we call “deep-level diversity.” Currently, deep-level diversity is a catchall construct that captures all characteristics on which team members may differ that are not immediately or visually obvious. It has been used to capture not only informational differences across team members, but also differences in values and beliefs (Harrison et al., 1998; Jehn et al., 1999), personalities (Harrison et al., 2002), and time orientation (Mohammed and Nadkarni, 2011, 2014; Mohammed and Harrison, 2013), among others. Given that no two people are identical (i.e., even identical twins diverge based on their experience in the world), all real teams, by definition, will have some form of deep-level diversity, making it impossible to contrast them to any teams that are truly homogeneous, not just on the dimension of interest in a specific study. This suggests the need to rethink the deep-level diversity construct.

A third implication for future research on diverse teams is to answer the calls to explicate the dynamic nature of team processes (Cronin et al., 2011). The dynamic perspective helps to better understand why some groups exhibit a virtuous cycle of information integration and superior decision making, whereas others are caught in a vicious cycle of increasing sub-group identification, conflict, and lack of communication. The emerging perspective elaborates these dynamic effects within diverse groups, which have received little research attention (Cronin et al., 2011). This suggests new questions and directions for research on diverse groups, such as how changes in composition influence team performance (Van der Vegt, Bunderson, & Kuipers, 2010), and how member diversity affects subsequent group development over time. The new perspective also emphasizes the need for studies to examine diverse group interactions on a short time scale, because the key theoretical elements of the new perspective, such as coordination failures and misattributions, will only be visible through a careful process analysis of interactions among group members (Paletz et al., 2011).

Research Directions from the Dynamic Perspective

There are a number of specific research directions suggested by this review and implied by a more dynamic perspective for scholars of diverse teams. The first revolves around the core idea that coordination failure is at the heart of ineffective group processes in diverse teams. In order to perform effectively, teams must minimize two types of process losses—those that result from lack of cooperation or motivation and those that result from lack of coordination (Simon, 1947; Steiner, 1972). Cooperation losses result when group members' incentives are not aligned. This may occur because members have private goals or because they lack commitment to the team and shirk their responsibilities. The interpersonal problems that occur in diverse groups due to social categorization processes are typically viewed as just such a cooperation problem because

they result from group members' preferences to communicate and interact with similar others in the group rather than diverse others (e.g., Chatman & Flynn, 2001; Chatman et al., 1998; Lovelace, Shapiro, & Weingart, 2001). Therefore, the interventions for improving diverse group performance suggested in prior research typically address cooperation-based process losses rather than coordination-based process losses as suggested here.

Coordination-based process losses have received much less research attention than cooperation-based process losses. Scholars have neglected coordination losses in large part because of the flawed assumption that aligning goals and incentives automatically also aligns actions, thereby solving all coordination problems (Grant, 1996; Holmstrom & Roberts, 1998). Coordination is generally defined as an outcome, achieved when interacting individuals accomplish reciprocal predictability of action (Camerer, 2003; Heath & Staudenmayer, 2000; March & Simon, 1958; Puranam, Raveendran, & Knudsen, 2012; Simon, 1947). In contrast to cooperation issues, coordination failure results from an inability (rather than unwillingness) to work together effectively. It is now well known that even highly motivated groups often suffer lower performance because they neglect group processes that foster coordination (Camerer, 2003; Knez & Camerer, 1996; Heath & Staudenmayer, 2000; Srikanth & Puranam, 2014). Though incentive alignment aids in achieving coordination, in and of itself, incentive alignment is neither necessary nor sufficient to achieve coordination (Camerer, 2003; Puranam et al., 2012). Research from across a range of disciplines such as organization theory, behavioural economics, social psychology and psycho linguistics suggests that coordination problems between group members arise due to lack of common ground, defined as 'knowledge that is shared and known to be shared' (Camerer, 2003; Clark, 1996; Schelling, 1960; Srikanth & Puranam, 2011).

Group members with diverse affiliations and backgrounds by definition are likely to have different perspectives on the task and how to achieve task goals (Harrison et al., 1998). For example, as Nisbett (2003), Pfeffer (1983), Bantel and Jackson (1989), and others have argued, individuals with different life experiences are likely to view and interpret events from their unique perspectives. Therefore, they are likely to have divergent beliefs about appropriate task-relevant and interpersonal actions, leading to coordination problems. This suggests that diverse groups, while more likely to benefit from their informational differences, at the same time are also more likely to suffer from coordination losses arising from the lack of common ground.

Since ongoing communication is one of the most powerful means to generate common ground, prior work has generally equated communicating with achieving coordination (March & Simon, 1958; Thompson, 1967; Tushman & Nadler, 1978). Consistent with that work, many group diversity researchers have also tended to assume that coordination issues arising from representational gaps are fairly easily resolved through adequate communication, and therefore have theorized that the problem with diverse groups is that they are unwilling to communicate due to social identity processes (i.e., a motivational problem). However, Camerer (2003, p. 337) observes that the assumption that communication solves all coordination problems is “wrong in practice and in theory.” For instance, psycholinguistics think of communication itself as a coordination game (Clark, 1996), which depends on a prior stock of common ground to build understanding. For diverse teams, who lack that common ground, communication will therefore also be problematic, and may not help teams to transcend representational gaps.

The emerging dynamic perspective therefore calls for more attention to the role of coordination over motivational issues in diverse teams. In particular, future research should investigate precisely how and why coordination problems arise, the likelihood of coordination

problems with different kinds of diversity, and solutions beyond communication for how to establish common ground in order to overcome those problems. Apart from studies in the lab on diverse group information processing, there is also an urgent need to understand how much surface-level and deep-level differences co-vary in the field, especially in routine information processing tasks versus in creative tasks, and how these are related to coordination-based process losses in groups.

A second avenue for further research suggested by the dynamic perspective is to investigate why interpersonal relations in diverse teams disintegrate over time, beyond the focus on social categorization processes in the literature to date. One possibility that rises from a study of diverse groups with multiple specialists and from studies of virtual teams is that group members typically do not appreciate the fundamental causes of coordination failure and are likely to attribute these problems to other causes. In particular, group members are likely to misattribute coordination problems as cooperation problems (Armstrong & Cole, 2002; Cramton, 2001; Heath & Staudenmayer, 2000; Wageman, 2003). Once cooperation attributions are made, members behave in ways that exacerbate the underlying coordination failure. For example, one group member who views another as lacking commitment to the group task may withhold communication about important group matters or attempts to exclude the “errant” group member, leading to further process losses. Thus, coordination failure, once misattributed, makes it more likely that a group suffers from lower trust, higher conflict, and other dysfunctional group processes, thereby reducing performance.

Anecdotal evidence suggests that the misattribution of coordination problems as cooperation problems is pervasive. For example, both Cramton (2001) and Armstrong and Cole (2002) find that in virtual teams, small issues escalate quickly into major conflicts and cause

serious group performance problems. Accidental coordination mishaps, such as forgetting to copy emails to a member of the remote team, for example, are interpreted as deliberate attempts to exclude them from the information flow. The “aggrieved” party then retaliates by withholding his or her information. This leads to a self-reinforcing cycle in which relationship conflict increases and information transfer decreases (Armstrong & Cole, 2002), ultimately leading to poor group performance.

An important future research stream is to investigate the relationship between social categorization processes and misattribution processes specifically. To this end, future research could be directed toward understanding how surface-level and deep-level diversity relate to the misattribution of coordination failures as motivation failures. For example, researchers could manipulate coordination failure and investigate whether group members are likely to make such misattributions more often regarding others who are different in a salient way.

A third specific avenue for further research suggested by our review comes from the relationship between surface-level diversity and coordination. The dynamic perspective also suggests a more complex relationship between surface-level diversity and team performance than has typically been incorporated into the double-edged sword model, because surface-level diversity may have both positive and negative effects on coordination. On one hand, as we suggested based on our review of the literature, surface-level diversity may reduce the likelihood of coordination failures by helping diverse teams to coordinate. On the other hand, when coordination failures do occur in groups with surface-level diversity, surface-level differences may exacerbate the likelihood of misattribution and attendant group process losses. Therefore, the precise nature of those effects requires further research attention.

One critical area where research is needed is to understand whether surface-level differences increase the likelihood of coordination failures. Though surface-level differences oftentimes point to underlying deep-level differences, it could also be that coordination failures are more likely to occur across social categories. One reason for such increased incidence may be that team members believe that surface-level differences are not pertinent to the task at hand (i.e., an attempt to be color-blind) or avoid engaging diverse others (cf. Rattan & Ambady, 2013) and therefore fail to look for or expect representational gaps. In short, better understanding how surface-level diversity may cause coordination failure is one avenue for future research.

Another way of researching how surface-level diversity may cause coordination failure is to elucidate whether surface-level differences exacerbate the misattribution process. This is plausible simply because social categories may provide a salient basis for attributing failures. For example, the stereotype that men are more dominant during group discussions or that members of Asian cultures tend to be more introverted may be used to explain why a poor decision was reached (i.e., because the opinions of others in the group were not heard, or because some group members did not speak). Since individuals tend to attribute negative outcomes to external sources like other people (Snyder, Stephan, & Rosenfeld, 1976), and individuals also tend to hold more negative views of out-group members when compared to in-group members (Tajfel, 1979), surface-level diversity is likely to be an easy target for group members to ascribe lack of cooperation to members who are different from themselves on any salient category. Future research needs to investigate whether groups with high surface-level diversity are more likely to misattribute coordination problems as cooperation problems compared to homogeneous groups. The misattribution problem we highlight is different from the conflict that arises from representational gaps (Cronin & Weingart, 2007). They argue that conflict arises because

members tend to value their own representations over that of out-group members and may therefore be unwilling to alter their work plans. Whereas our question here is whether people misattribute coordination problems as a lack of cooperation from teammates.

A fourth specific avenue for further research suggested by our review comes from the idea of the spiral of diverse team performance. The short-term and long-term effects we have described thus far are able to explain why groups that only have deep-level diversity can have high levels of conflict and poor performance over time without invoking social categorization effects. Moreover, these effects create a reinforcing cycle of group performance over time. Once caused, the misattribution of coordination failures can create ineffective group dynamics that can trigger the negative interpersonal dynamics oftentimes associated with surface-level diversity. The downward spiral of reduced trust, increased relationship conflict, and poor performance becomes self-reinforcing (cf. Ferguson & Peterson, 2015; Zand, 1972). For example, Ferguson and Peterson (2015) show that diversity on propensity to trust (i.e., a deep-level diversity variable) is sufficient to cause a downward spiral in newly formed teams, even after controlling for surface-level diversity (e.g., nationality, gender, etc.). Alternatively, when surface-level diversity helps groups to overcome coordination failures, it could create a reinforcing positive spiral of increased interpersonal communication, greater trust, and lower relationship conflict. For example, in teams with an appreciation that surface-level diversity may be linked to meaningful deep-level diversity, misunderstandings and coordination failure may trigger increased communication, and group members may experience positive feedback that provides them with a sense of coming to understand one another that improves interpersonal relations on the team (e.g., Peterson & Behfar, 2003). Further research into the spiraling effects of diversity over time is therefore another direction for future research. Specifically, we need to understand

how groups can prevent the spiral from initiating and how they can terminate negative spirals even after they have taken hold and move group dynamics in a more positive direction.

A fifth and final avenue for further research suggested by our review revolves around the boundaries of the dynamic perspective. As the field elucidates a more dynamic view of group diversity, it is worthwhile to consider boundary conditions and key assumptions that are already well researched in other literatures. For example, the emerging dynamic perspective is bounded by the assumption that group members come together with the intention of working together cooperatively to achieve a task. If group members have divergent goals and interests, problems are likely to occur even outside of the coordination problems we highlight here. Poor performance in this case can be directly attributed to misaligned incentives rather than to coordination processes. To the extent that misaligned incentives are coincident with demographic differences, such as in much of the field research on faultlines, the problem is still one of misaligned incentives rather than of diversity. However, it is interesting to investigate whether diversity itself causes or exacerbates such misalignment, rather than assume that is always the case. Similarly, we assume that group members do not bring a negative mind-set toward specific other social groups or individuals into the team. Again, that could be a cause of genuine interpersonal friction that did not result from coordination failure but rather from prejudice. However, those problems have been discussed extensively in the literature elsewhere, and we submit that they may be decreasing in importance in a globalizing world (Bobo, et al., 2012), as in general, employees become more accustomed to interacting with and develop more positive attitudes toward diverse others. This is in contrast to coordination issues, which may be increasing in importance as both tasks and teams are becoming more complex (Wageman et al.,

2012). Our purpose here is to elucidate how diverse team performance could be disrupted, even with the best will and intention to collaborate.

There are, of course, other opportunities to integrate dynamic perspectives into the model of diverse teams that we have not explored here, that may further deepen the dynamic model. One opportunity is to consider time itself as an input into the process of interacting with diverse groups. For example, there is growing interest in how differences in group members' temporal orientations acts as a form of deep-level diversity to shape group interactions and outcomes (Mohammed & Harrison, 2013), but we have not considered how those orientations may influence the processes described in our model. A second opportunity is to explore how the explanatory mechanisms in the emerging tropical depression model may themselves change over time. Whereas we have suggested that surface-level diversity provides cues about deep-level diversity, we have not examined in detail how the salience of those cues may shift over time. Similarly, it may be the case that team members' perceptions of deep-level differences on the team, contained in transactive memory systems or shared mental models, change over time (e.g. Zellmer-Bruhn et al., 2008). A final opportunity is to consider moderators of the dynamic process we described. We suggest surface-level diversity as one factor that can enhance or attenuate the self-reinforcing cycle, but other factors may also disrupt or aggravate the temporal dynamic. These unexplored directions notwithstanding, we believe that the emerging dynamic perspective points in a new direction and makes a number of important contributions.

Conclusions and Contributions

Our paper identifies and explores an emerging dynamic model of the effects of team diversity, revealing a temporal ordering to the constructs typically used to explain diversity's effects on group processes and outcomes. Our goal is to review the literature on diverse teams through a

dynamic and temporal lens and reveal new relationships and new mechanisms through which diversity exerts its effects on team performance. This more dynamic perspective on diverse groups suggests that rather than thinking of diversity as a paradox of the double-edged sword, conceptualizing the effects of diversity as like a tropical depression that can spiral into a hurricane or diffuse into a rainstorm, requiring an over-time analysis, can shed additional light on managing diversity.

On one hand, this new perspective suggests that the problems associated with diversity may be more persistent than currently articulated in the literature. This is because of diversity's negative effects stemming from both deep-level and surface-level diversity, rather than primarily from surface-level diversity. Specifically, a broader reading of the literature on diverse teams suggests that informational diversity, which is what makes diverse teams valuable, can in and of itself lead to poor performance because of problems associated with coordinating diverse information. On the other hand, to the extent that coordination failure is a more fundamental and proximal result of diversity in groups than social categorization, preventing coordination problems early in group development is likely to enable a group to capitalize on the positive aspects of social categorization while avoiding the negative effects, providing a more optimistic outlook for the future of an increasingly diverse workforce.

The emerging dynamic perspective better reflects the full range of literature on diverse groups than the double-edged sword model. It also reveals potential new ways to resolve the paradox of diverse teams. It suggests, for example, that teams are initially motivated to use their diverse informational resources. However, they are less effective at integrating and coordinating those resources. Equally importantly, the emerging perspective suggests that surface-level diversity can actually have the counterintuitive effect of aiding group process and integrating

informational resources because demographically different group members anticipate and manage differences and so become more effective at group coordination. This notion that surface-level diversity might help groups runs directly counter to the dominant double-edged sword view of the effects of diversity. This emerging perspective suggests the possibility that the negative interpersonal effects of diversity that have been found in studies over longer periods actually develop over time only after a group experiences coordination difficulties, rather than in immediate response to group members engaging in and acting on social categorization of each other. By replacing the logic of diversity as a “double-edged sword” that calls for balance and trade-offs, the emerging dynamic perspective or metaphor of diversity as a tropical depression redirects research and managerial attention toward identifying enabling factors that can shift the influence of diversity from a vicious downward spiral sparked by social categorization to a virtuous one of anticipating challenges that encourage more and better information processing.

From a managerial perspective, this emerging perspective hints at new and different advice than that coming from the double edged sword perspective. In particular, it suggests the need to continue to identify tools for managing misattribution of coordination failure as lack of cooperation, particularly by way of members who are different. In addition to established means of containing misattribution such as intragroup trust (e.g., Simons & Peterson, 2000), new approaches are needed. For example, rather than focussing on norms of belongingness and identity to build team cohesion and cooperation in diverse teams, this perspective points toward the efficacy of creating norms of understanding that all group processes will involve mistakes, misunderstandings, and coordination failures. To the extent that coordination challenges are seen as normative, they will cease to need to be explained as something extraordinary or in need of

attribution of blame for the failure. Rather, coordination challenges in diverse groups are best seen as something to be engaged, addressed, and ameliorated.

The literature on conflict resolution in teams specifically holds some insight into how groups can and should work through such differences in perspective (i.e., deep-level diversity). This literature highlights the need for a *process* of managing conflict that can help to achieve process effectiveness and resource efficiency (i.e., coordination), as well as cohesive working relationships and satisfaction of group members (i.e., cooperation) (e.g., Thomas, 1992). For example, Behfar et al. (2008) looks at highly diverse teams and finds that teams that both perform well (i.e., coordinate effectively) and have high satisfaction (i.e., a sense of cooperation) engage in specific behaviors such as focusing on communication content rather than style, understanding explicitly the reasons behind any compromises, and forecasting workload and scheduling problems. Indeed there is a long history of research in this domain that needs to be effectively integrated into the literature on diverse groups.

In sum, the emerging perspective in diverse teams redirects research and managerial attention toward identifying enabling factors that can shift the influence of diversity from a vicious spiral that arises from fearing differences to a virtuous one of increased information processing, improved interpersonal relationships, and enriched understanding of our colleagues that arises from embracing differences. We believe this perspective will make for interesting research and ultimately answer our opening question of why some diverse groups outperform homogeneous groups, while others severely underperform.

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TABLE 1: Examples of Studies of Diversity across Temporal Horizons

Studies demonstrate that initially, diverse groups have positive informational and social environments. In the medium term, problems effectively using information occur. It is only in the longer term that both informational benefits and social problems are found.

Example Study	Temporal Frame	Measures	Findings	Potential Interpretation & Implications for Our Research
Bezrukova et al., 2009	Long All teams had tenure over one year	DV: Performance evaluated based on awards given once per year Mod: Team identification coded from one year of HR-related project documentation as an aggregate measure	Negative effect of social category fault-lines on performance Team identification moderated these negative effects	In the longer term, groups experience benefits from informational diversity and negative interpersonal processes related to social category diversity
Wiersema & Bantel, 1993	Long Top management teams	DV: Changes in strategy over 3-year period	Positive effect of academic background diversity on likelihood of making strategic change	
Pelled et al., 1999	Long Average team tenure of over 10 months (0.89 years)	DV: Aggregate ratings of team performance by supervisors Med: Aggregate measure of team conflict Mod: group longevity	Positive effect of diversity on group performance and conflict Diversity-conflict link moderated by group longevity so that over time, positive relationship between diversity and conflict diminishes	These effects are mediated and moderated by group processes like conflict
Harrison et al., 1998	Long Average team tenure over 2 years	DV: Group cohesiveness Mod: Group tenure	Negative effects of demographic diversity on group cohesion decrease over time Negative effects of deep-level diversity on group cohesion increase over time	Over time, social category related diversity becomes less problematic, whereas informational diversity becomes more problematic / less beneficial
<p>Summary: Studies that measure effects in the long term find evidence for informational benefits and social category problems, along with a variety of moderators of the relationship between diversity and performance.</p>				

<p>Harrison et al., 2002</p>	<p>Medium 9–14 week MBA & undergraduate teams with measures taken after 3–5 weeks and end of team interaction</p>	<p>DV: Aggregate measure of social integration taken at end of project; expert ratings of team performance</p>	<p>Negative effect of both surface-level and deep-level diversity on social integration</p> <p>Negative effect of surface-level diversity is negatively moderated by collaboration, such that the more teams collaborate, the negative effects of surface-level diversity diminish</p> <p>Negative effect of deep-level diversity is positively moderated by collaboration, such that the negative effects of deep-level diversity intensify</p>	<p>Groups with informational diversity experience difficulty collaborating effectively, particularly as they become more exposed to their deep-level differences</p>
<p>Van der Vegt et al., 2006</p>	<p>Medium 9-month student teams with measures taken after 3, 6, and 9 months</p>	<p>DV: Aggregate measure of interpersonal helping; performance measured by expert ratings</p> <p>Med: Interpersonal commitment</p>	<p>Diversity in levels of expertise associated with asymmetrical patterns of interpersonal helping, such that members provided more help to those with higher perceived expertise</p> <p>Relationship between expertise diversity and helping mediated by interpersonal commitment; members were more committed to those they perceived as more expert</p>	
<p>Dahlin et al., 2005</p>	<p>Medium 7-week MBA teams</p>	<p>DV: Written case study analyses were coded to identify range, depth, and integration of information</p>	<p>Diversity in educational background led to use of a greater range and depth of information, but less integration of information</p> <p>Diversity in nationality had a curvilinear effect with information range, depth, and integration</p>	

Summary:

Studies that measure effects in the medium term find that the precise nature of information use depends on group diversity; diverse groups are better at accessing and discussing information uniquely held by one group member, but not as effective at integrating it (i.e., coordinating). Some evidence demonstrates that deep-level diversity becomes harmful to interpersonal processes over time.

Homan et al., 2007	<i>Short</i> Newly formed experimental groups	DV: Discussion coding of information elaboration	Positive effect of informational diversity on information elaboration Positive effect of informational diversity moderated by valuing diversity; groups that valued diversity elaborated more than groups that did not value diversity	Value of informational diversity is not automatic in diverse groups
Phillips, Northcraft, & Neale, 2006	<i>Short</i> Newly formed experimental groups	DV: Discussion coding of unique information recognized; aggregate measures of attraction to group	Positive effect of surface-level diversity on information sharing and performance on hidden profile task	Surface-level diversity can produce positive group processes and aid the effectiveness of deep-level diversity
Phillips & Loyd, 2006	<i>Short</i> Newly formed experimental groups (MBA students)	DV: Expectations of similarity; surprise & irritation at others' views (measured immediately after learning about them)	Surface-level diverse groups were perceived as more positive and accepting	
Summary:				
Studies that measure effects in the short term by examining interactions between members of newly formed teams find that groups with surface-level diversity experience both informational benefits and positive group interpersonal processes, and that positive group interpersonal processes help groups to integrate information.				

FIGURE 1: Current model of the relationship between group diversity and performance

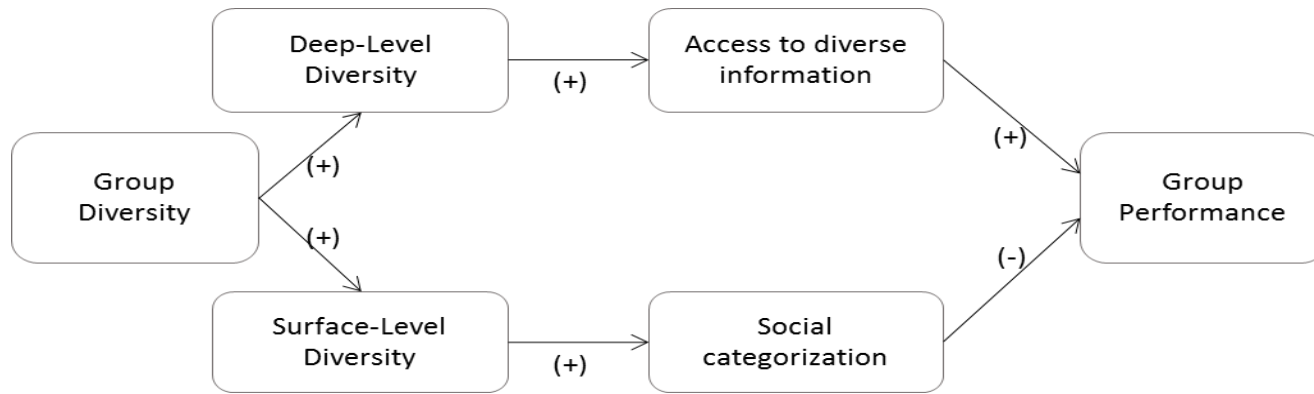


FIGURE 2: Temporal perspective on the relationship between group diversity and performance

