Transactive Memory Systems, Conflict, Size and Performance in Teams

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Drawing on transactive memory theory, we propose that transactive memory systems (TMS) operate as a meta-resource that enhances team performance directly by generating resource surpluses and indirectly by diminishing the unnecessary expenditure of resources on inter-member conflict. We also propose that this mediated relationship is moderated by team size. In conceptualizing TMS as a meta-resource, we advance a theoretical model which posits a critical role for TMS in preventing resource losses stemming from dysfunctional member interactions. This model also helps to explain the performance benefits observed in previous TMS research and the boundary conditions exerted by group size.

INTRODUCTION

As intensifying competitive pressures require organizations to accomplish more with fewer resources, the division of labor via teams has become increasingly common. Work in teams requires the expenditure of scarce resources such as time, attention, and energy to manage coworker interactions, maintain expertise, and complete tasks. Transactive memory systems (TMS) provide teams with an effective means to manage scarce resources (Bourgeois, 1981; Faraj & Sproull, 2000; Lewis, Lange, & Gillis 2005; Moreland 1999). TMS has been described as a network of individual memories (Wegner, 1987; p. 206), whereby members maintain a shared cognitive directory of which team members have the most appropriate expertise for collective tasks (Brandon & Hollingshead, 2004; Lewis & Herndon, 2011). This directory facilitates cooperative information encoding, storage, retrieval, and processing that can improve team performance (e.g., Austin, 2003; Lewis, 2003; Lewis, 2004; Liang, Moreland, & Argote, 1995; Moreland, 1999; Moreland, Argote, & Krishnan, 1996, 1998; Moreland & Myaskovsky, 2000; Zhang, Hempel, Han, & Tjosvold, 2007).

Prior research has focused on the capacity of TMS to facilitate mobilization of a greater amount of resources than members could working alone (e.g., Faraj & Sproull, 2000; Hollingshead, 1998; Lewis, Belliveau, Herndon, & Keller, 2007; Lewis et al., 2005; Liang et al. 1995). However, missing from this focus is theory addressing the capacity of TMS to prevent resource losses due to dysfunctional member interactions (Ren & Argote, 2011). Given the potential for TMS to alleviate a range of conditions such as self-regulatory failure (Muraven & Baumeister, 2000), job burnout (Lee & Ashforth, 1996), role conflict

(Jackson & Schuler, 1985), or intra-team conflict (Jehn, 1995; Pondy, 1967), that depletes performance-enhancing resources, this is an important omission. From the universe of resource depleting conditions that potentially operate within teams, we chose to focus on intra-team conflict as an exemplar in this research, as it has been widely recognized as a significant driver of resource depletion in teams engaged in non-routine, complex activities (Carnevale & Probst, 1998).

Conflicts may be task or relationship focused; the former involving disagreements over ideas, strategies and opinions, and the latter stemming from incompatible personalities and values (Jehn, 1995; Jehn, Rispens, & Thatcher, 2010). Conflicts that threaten individuals' interests, well-being and self-esteem are likely to elicit feelings of stress, anger, and tension (Dijkstra, Van Dierendonck, Evers, & De Dreu, 2005), the resolution of which requires resources otherwise devoted to tasks (De Dreu 2006). Although research has explored the resource enhancing benefits of TMS, such as learning (Akgun, Byrne, Keskin, Lynn, & Imamoglu, 2006), knowledge sharing (Choi, Lee, & Yoo, 2010), team reflexivity (Dayan & Basarir, 2009), and team intuition (Dayan & Elbanna, 2011), theory development focused on the potential for TMS to mitigate against intra-team resource depletion has lagged.

Conflict is largely seen as inevitable in knowledge-intensive team-based work (Lovelace, Shapiro, & Weingart, 2001). Conflict can damage trust (Langfred, 2005) and hurt team performance (de Wit, Greer, & Jehn, 2012), in part because conflict taxes members' limited information processing capacity (Shaw, Zhu, Duffy, Scott, Shih, & Susanto, 2011; Simon, 1957). Although research has demonstrated the resource-efficiency benefits of TMS (e.g., Hollingshead 1998; Lewis et al. 2005; Liang et al. 1995) and the costs of conflict (Shaw et al., 2010), missing has been evaluation of relationships between TMS and intra-team conflict (for exceptions, see Rau, 2005), or the role of conflict (or of any other resource depleting mechanisms) as an explanation for the performance benefits of TMS. The exclusive focus on the resource enhancing benefits of TMS, to the exclusion of a focus on the role played by TMS as a means to mitigate conditions that result in resource losses, has left a theoretical gap in our understanding of the mechanisms accounting for the performance benefits of TMS.

Thus, the first purpose of our manuscript is to address unexplored mediating mechanisms of the relationship between TMS and team performance. Drawing on perspectives from the literatures on TMS and conflict, we propose that TMS increases the resources available for effective performance, in part by diminishing the conditions that fertilize resource-depleting conflicts. A second purpose of our manuscript is to address the relatively neglected linkage between TMS and intra-team conflict. Transactive memory theory suggests that a TMS is evidenced when a team's members possess specialized expertise, rely on one another to be responsible for specific aspects of task-relevant knowledge, and coordinate information processing and task activities (Lewis, 2003). Without a TMS, members' expertise is more likely to be redundant, incompatible, and difficult to integrate. We argue that teams with a less developed TMS encounter more discordant task-related information (e.g. task conflict) and higher levels of tension, stress and inter-member resentment (e.g. relationship conflict) while completing tasks (Ellis, 2006).

Third, prior theorizing on TMS and performance (Palazzolo, Serb, She, Su, & Contractor, 2006; Ren, Carley & Argote, 2006) has introduced team size as a boundary condition of the relationship between TMS and team performance. While some research has reported that TMS may emerge more easily (Michinov & Michinov, 2009) and have stronger performance consequences (Jackson & Moreland, 2009) in smaller groups, other research suggests that the benefits of TMS may be more pronounced in larger teams (Ren et al., 2006). Here, we seek to advance TMS theory by introducing team size as moderator of the relationship between TMS and intra group-conflict, and also of the indirect effects of TMS on performance *via* task and relationship. Our conceptual model is presented in Figure 1.

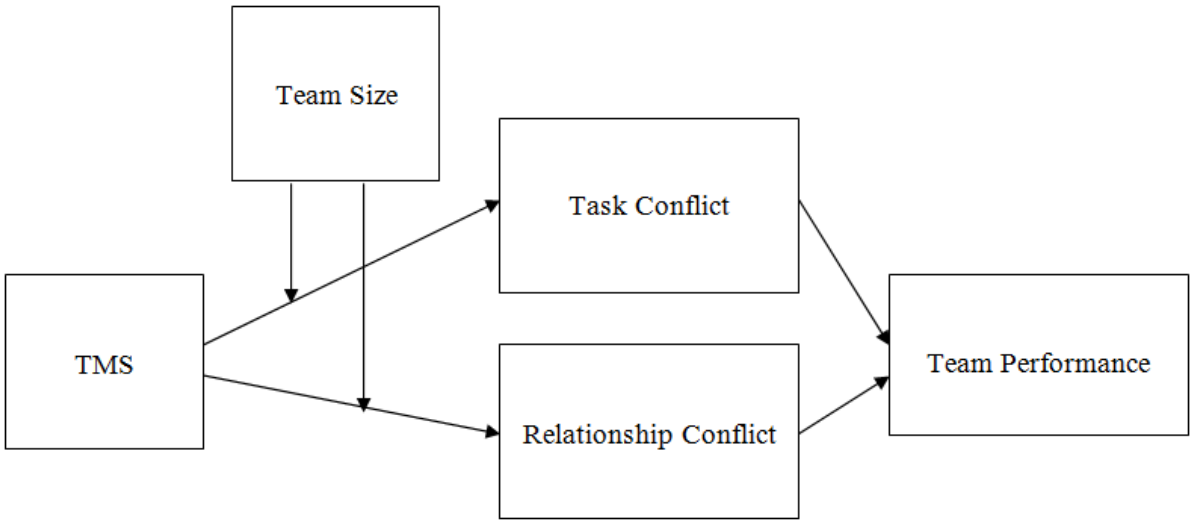
THEORETICAL DEVELOPMENT AND PROPOSITIONS

Transactive Memory Systems (TMS) and Team Performance

TMS theory is based on the observation that interdependent individuals tend to implicitly divide responsibility for learning, remembering, and communicating discrete information needed for joint tasks (Wegner, 1987; Wegner, Giuliano, & Hertel, 1985). Transactive memory is analogous to an individual's

memory system, which combines knowledge stored in an individual's mental structures, and the processes by which information is encoded, stored, and retrieved from them (Lewis, 2003). Similarly, a team's TMS consists of structure and process components. The structure component is a representation of members' shared understanding of "who knows what"— that is, which members are associated with what expertise. The process component consists of a set of transactive processes (encoding, storage, and retrieval processes) related to knowledge acquisition and use (Lewis & Herndon, 2011). The processes of a team TMS are described as *transactive* because they depend on interaction and communication between members for their execution (Wegner, 1987).

FIGURE 1
A MODERATED MEDIATION MODEL OF TMS, CONFLICT, TEAM SIZE AND TEAM PERFORMANCE



The extent that teams have a well-functioning TMS can be characterized by the presence of three principle features. The first is *differentiated* expertise, which reflects the extent to which members specialize in knowing about different but complementary aspects of the group's task (Lewis, 2003). As members come to share an understanding of which members specialize in what knowledge, the TMS is strengthened. The second is the extent that members rely on other members for specific task-relevant knowledge. If members deem others' expertise to be *credible,* they are more likely to specialize in aspects of team tasks not already covered by others (Lewis, 2003). The third feature reflects the ease with which members' expertise is located, integrated, and applied towards the fulfillment of collective objectives (Lewis, 2003). The ability to orchestrate the integration of specialized member expertise with few mistakes, restarts, or misunderstandings is evidence of the efficient information processing that is characteristic of a TMS. When all three features (termed specialization, credibility, coordination: Lewis 2003) are observed concurrently, it is evidence of a TMS (Lewis and Herndon, 2011; Liang et al., 1995).

A TMS provides several benefits to teams. First, when members share an understanding of who is responsible for what expertise, searching for information becomes fast and efficient. Second, when new information is encountered by the team it can be allocated quickly to member-experts most able to store it for later retrieval (Brandon & Hollingshead, 2004). This ensures that task-critical information is not ignored or forgotten. Third, relying on others to be responsible for complementary knowledge domains frees members to focus on developing deeper and potentially more relevant expertise in his or her respective domain area (Lewis, 2003). Consequently, a large amount of task-relevant knowledge is

available to assist teams in achieving high levels of performance. Given the above arguments and prior empirical research that has demonstrated significant links between a team's TMS and performance (e.g., Austin, 2003; Lewis, 2003; Lewis, 2004; Liang et al., 1995; Moreland, 1999; Moreland et al., 1996, 1998; Moreland & Myaskovsky, 2000; Zhang et al., 2007), we expect that TMS is positively related to team performance.

TMS and Intra-Team Conflict

One of the challenges associated with complex interdependent work is the emergence of conflicts as members seek to function collectively to achieve common goals (Kelley & Thibaut, 1978; Rusbult & Van Lange, 2003). Intra-team conflict is generally recognized as the perception of incompatibility regarding values, viewpoints, and preferences pertaining to task or relationship issues (Jehn, 1995). Task conflicts consume time, effort, and cognitive resources as members engage in task-related debate and discussion. Task conflict may be minimized when members perceive that their work-related ideas, viewpoints or opinions complement rather than oppose those of other team members. Relationship conflicts are indicative of members' perception of incompatibility regarding values and personal issues (Jehn, 1997). Relationship conflict also consumes scarce resources as members engage in negative, emotionally intense interactions with other members (Shaw et al., 2010). Relationship conflict may be triggered when individuals feel threatened, disrespected, mistreated, or overlooked by another, resulting in anger, frustration and withdrawal (Jehn, 1997).

Although much research attention has been focused on the consequences of team conflict (de Wit et al., 2012), far less has been paid to its antecedents. We argue that TMS diminishes the incompatibilities that lead to inter-member conflicts. Conversely, in the absence of a TMS, the incompatibilities that lead to conflicts are likely to be more prevalent for the following reasons: 1) without a TMS, members do not have accurate understandings of which members are responsible for which areas of expertise; 2) members have little confidence in others' expertise; and 3) members are more likely to experience coordination problems related to locating, retrieving or applying expertise towards the team's tasks.

Inaccurate Understandings of "Who Knows What"

Inaccuracies in members' understandings of "who knows what" slows the search for information (John asks Sally for information that Sally does not possess) and reduces efficiencies that might otherwise be gained by a shared division of cognitive labor (Moreland, 1999). When members possess inaccurate, incomplete or unshared understandings of who is responsible for what expertise, members will spend more time and energy chasing information (e.g. mistakenly seeking expertise from non-domain experts). Failing to retrieve expertise from others when it is needed can create frustration and anger between team members. Members on "wild goose chases" may develop resentment towards those who either do not have sought-for information or who steered them toward the wrong team member.

Misperceptions regarding expertise assignments also may lead to the misrouting of newly acquired information to the wrong members, or to multiple members—leading to multiple members feeling responsible for the same domain. For example, if John mistakenly assumes that Sally understands software testing, he may focus his efforts on software design. However, if Sally actually has software *design* rather than testing expertise, then John's learning efforts will duplicate rather than complement Sally's expertise. This results not only in a waste of his time and energy, but also may lead to inadvertent competition, turf wars and unproductive rivalries.

Task disagreements are more likely when multiple members possess expertise in the same domain, as members are apt to hold divergent views on task issues. For example, if Susan perceives both John and Sally as experts in a particular domain she may present both with the same expertise request. However, due to differences in individuals' interpretation of information (Daft & Macintosh, 1981), expertise retrieved from these parties may be relevant, yet contradictory. The retrieval of redundant or non-complementary information may initiate debate among members seeking to resolve emergent task-related discrepancies.

In the absence of clear information about each member's expertise, members may draw inferences about expertise using other available cues, such as gender (Hollingshead & Fraidin, 2003), job titles, tenure in the team, etc. Searches based on inaccurate understanding of member-expertise associations are likely to lead to frustration and confusion (Sally is annoyed by John's asking her about testing protocols; Mike wonders why John is asking Sally for information that Mike actually possesses), or to the stressful realization that no one actually has the necessary information. Moreover, members with inaccurate perceptions of others' expertise may overlook opportunities to route newly acquired information to the appropriate expert for storage and future retrieval (Frank admits to Nancy that he read an article related to her expertise domain, but didn't forward it because he was unaware of her expertise). Missed opportunities for transactive storage are likely to create tensions between experts deprived of insight, and other members who may have benefitted from the lost information. As a result, misperceptions or ignorance regarding "who knows what" may lead to inefficient storage of expertise, experienced expertise incompatibilities, resentment, and frustration.

Low Knowledge Credibility

The development of TMS requires that members establish credibility in their area of expertise. Hollingshead (1998) describes several ways in which expertise is established. For instance, credibility can be declared by detailing one's credentials and familiarity (or lack thereof) in a particular domain. Expertise also may be established by making inquiry of another's expertise or elaborating one's response to such an inquiry. In the absence of such actions, members are likely to have low confidence in others' expertise—a condition we argue leads to the generation of conflict.

For example, consider the phenomenon of double-checking. Double-checking occurs when a member seeks additional verification regarding the accuracy, relevance or reliability of information provided by another—particularly one of low-credibility (Lewis, 2003). When expertise is in question, members will attempt to alleviate doubt by comparing and contrasting disputed expertise with information in their own memory or that of a third party (Hollingshead, 1998). In contrast, when credibility is high, members will tend to accept retrieved expertise on "good faith," seeing little need to double-check highly credible members' expertise (Lewis, 2003). By considering a greater number of perspectives, particularly from different sources, double-checking increases the likelihood that conflicting or incompatible perspectives will emerge (i.e. task conflict). Moreover, if double-checking occurs in the presence of others, third parties also are more likely to become aware of incompatible perspectives.

In addition to stimulating task conflict, double-checking may also lead to relationship conflicts. Following a transactive retrieval, perceptions of low credibility may compel the retriever to return to the questionable expert to ensure the appropriateness of the retrieved expertise (Hollingshead, 1998). Members whose expertise is questioned may be resentful and annoyed by requesters' lack of faith. Similarly, the double-checker also may be resentful of the additional time and effort spent verifying the accuracy and/or relevance of the information. Moreover, double-checking also may be seen as a personal attack, or attempt to embarrass or socially undermine, particularly if it occurs publicly (Simons & Peterson, 2000).

Coordination Problems

Finally, when a TMS is poorly developed, resulting coordination problems also are likely to create conflict. Coordination problems can be characterized as errors in transactive encoding, storage, and information retrieval (Lewis et al. 2007). Coordination problems occur when members: a) fail to retrieve accurate/useful expertise from members (mis)perceived as domain experts; b) waste time searching for expertise on behalf of requesters making inappropriate expertise requests; c) experience difficulty integrating their respective expertise with another member (i.e. non-complementary expertise); or d) are required to recall and make corrections to deliverables that failed due to expertise-related issues.

For example, encoding and storage errors occur when new information encountered by the team goes unclaimed by any member. Such errors are likely if members incorrectly assume another member is responsible for that information. When members realize that no one actually possesses important

information needed for task processing, they may assign blame to another member for not knowing something they "should have known," fostering relationship conflict. Similarly negative outcomes are likely in the case of retrieval errors, which occur when members fail to retrieve information they actually possess (Sally forgot to mention information about a critical design feature to Susan), or when members fail to cue the recall of information possessed by another member (John failed to ask Mike about software bugs requiring immediate attention - Hollingshead, 1998).

In sum, low levels of specialization, credibility and coordination resulting from an inefficient TMS not only increases the incidence of conflict, but also compounds one another to exacerbate intra-team conflict. Misperceptions about "who knows what," in conjunction with coordination problems, can lead to a loss in confidence in others' willingness/ability to maintain and provide reliable and useful expertise. When confidence is low, members are likely to be reluctant to pass newly acquired information to domain "experts" seen as unreliable. Instead, members may seek expertise from non-domain experts based on friendliness, proximity or perceived accessibility rather than on the basis of domain assignments. Members who receive requests for expertise outside their domain may take offense if they attribute inappropriate requests to laziness, insensitivity, inattentiveness or incompetence on the part of the requester. Incomplete transactive memory (e.g. ignorance of who knows what) may create personal tensions through missed opportunities to transfer newly encountered information to experts for storage and later use by the team (Ho & Wong, 2009), leading to the following predictions:

Proposition 1a: TMS is negatively related to task conflict.
Proposition 1b: TMS is negatively related to relationship conflict.

The Contingent Effects of Team Size for the TMS-Conflict Relationship

Growing evidence in the teams literature suggests that the relationship between TMS and intra-group conflict are likely governed by team size. Evidence from the literature regarding the role played by team size has been somewhat inconclusive. For example, in a sample of student teams Michinov and Michinov (2009) reported that smaller groups were able to coordinate better than larger groups. Similarly, in a simulation study of 4 and 20 person networks, Palazzolo and colleagues (2006) found smaller groups to have greater communication as well as greater TMS differentiation and accuracy. Likewise, Jackson and Moreland (2009) reported that the strength of the relationship between TMS and performance decreased as team size increased. In contrast, Ren et al. (2006) reported that in simulated groups ranging in size between 3 and 35 members, TMS was more strongly related to efficiency and speed in larger groups, and to decision quality in smaller groups. Rationale offered for these observed differences may be derived from variance in the costs associated with locating, exchanging and integrating expertise in teams of different size.

Task Conflict

Coordination and communication costs are greater in larger teams due in part to more physical and psychological distance (i.e. actual and perceived) between members (Reagans & McEvily, 2003). Psychological distance instills reluctance to reach out to members perceived to be distant or unapproachable. The reluctance among members to communicate in larger teams also increases the probability that members will have poorer understanding of member-expertise associations, increasing coordination problems between members (Moreland, 1999; Palazzolo et al., 2006). As we note above, poor coordination of expertise drives task conflicts as members struggle to successfully integrate their unique perspectives (Amason and Sapienza, 1997; Wiersema & Bantel, 1992).

As team size increases, timely and accurate knowledge transfer also becomes increasingly difficult (Reagans & McEvily, 2003). Retention of who possesses, or requires, relevant expertise, as well as when expertise is needed, also is more burdensome in larger teams, increasing members' reliance on outdated information pertaining to the location, content or suitability of member expertise. This is likely to lead to misperceptions between members comparing and contrasting their respective expertise. Larger teams also are likely to have more members than expertise domains, a condition resulting in a greater likelihood of

multiple members maintaining expertise in the same domain (Palazzolo, 2005). The presence of overlapping and non-complementary expertise also increases the potential for exposing divergent perspectives. As a result, the importance of TMS as a deterrent for task conflict increases as team size increases. Thus, we predict the following:

Proposition 2a: Team size moderates the negative relationship between TMS and task conflict, such that the relationship strengthens as team size increases.

Relationship Conflict

In contrast with the physical and psychological distance that tends to pervade larger teams (Reagans & McEvily, 2003), in smaller teams there are fewer members, less 'distance' (Nooteboom, 2000), and also fewer relational barriers between members (Carron & Spink, 1995). These characteristics of smaller teams tend to create heightened evaluation potential (Harkins, 1987; Harkins & Jackson, 1985). Evaluation potential reflects the degree to which the contributions made by individual members, their relative level of knowledge in domains of responsibility, or their need for work-related help can readily be evaluated by other members (Karau & Kipling, 1993). In smaller teams, individual members are unable to "hide in the crowd" (Davis, 1969), or escape culpability for missing task-related expertise, mis-assigned task-related responsibility, or lost/missing critical task-related information. Further, in smaller teams because of heightened evaluation potential, seeking information one needs or admitting one doesn't possess critical information also poses a greater potential threat to the self-esteem and self-image (Tynan, 2005; White, Tynan, Galinsky, & Thompson, 2004) as information seekers are revealed as having a lack of expertise in a particular area (Borgatti & Foster, 2003). This experience is likely to be intensified in smaller teams due to the intimate nature of team interactions and relatively pervasive social transparency (Kerr & Brunn, 1981).

Further, because smaller teams also have fewer cognitive resources available for processing large amounts of diverse information (Bantel & Jackson, 1989; Eisenhardt & Schoonhoven, 1990) members' capacity effectively to maintain expertise in their domains of responsibility is likely to be strained in substantive ways. Because of inherent resource constraints, members are likely to have less comprehensive control of these domains, and to have expertise deficits, increasing the incidence of help and information seeking as members seek to alleviate their own ignorance of domains for which they have responsibility. Seeking information potentially leads to perceptions of incompetence and decreasing relative status and power (Lee, 1997). Further, not only can revealing ignorance be uncomfortable and strain invoking, but information seeking, or double checking of information also can have detrimental relational consequences (Ickes, Dugosh, Simpson, & Wilson, 2003). These consequences should be heightened in smaller teams where members are likely to be relatively less anonymous (Kerr & Bruun, 1981) and the information deficits of any specific member more easily localized.

Because TMS enhances the transparency of the operating constraints faced by members by establishing domain responsibility, this should tend to lead members to make external (vs. internal) and uncontrollable (vs. controllable - Weiner, 1980, 1985) attributions for members' information/helping seeking behaviors. Ascription of external/uncontrollable causes should tend to diminish inherent antagonisms otherwise present in the information/help seeking process (LePine & Van Dyne, 2001). Thus, we expect that the performance consequences of TMS realized through diminished relationship conflict are likely to be more pronounced in smaller versus larger teams, leading to the following prediction:

Proposition 2b: Team size moderates the negative relationship between TMS and relationship conflict, such that the relationship weakens as team size increases.

Intra-Team Conflict and Team Performance

A consequence of conflict is that those involved have fewer resources to devote toward activities that promote team performance (De Dreu & Weingart, 2003; de Wit et al., 2012). Research on conservation

of resources (Hobfoll, 1989) and threat-rigidity (Staw, Sandelands, & Dutton, 1981) suggests that when individuals experience feelings of threat or anxiety, they respond by becoming inflexible in their thinking and redirect resources toward the resolution of threats at the expense of other more productive activities. Task conflicts may threaten individuals' self-concept and identity by calling into question their expertise and competence (de Wit et al., 2012; Swann, Polzer, Seyle, & Ko, 2004). Task conflict also can trigger relationship conflict by catalyzing feelings of disrespect or offense (Pelled, 1996; Simons and Peterson, 2000). Disagreements may lead to fear for one's safety, particularly when opposition is hostile or provocative (Simons & Peterson, 2000).

In this way, both task and relationship conflicts restrict information processing, as evidenced by narrowing of attention or a reduction in the number of channels used to access information (Staw et al., 1981). Narrowed attention may lead to missed cues that another team member needs information that one has, or that another team member has information one needs. A team member who feels threatened may cope by withdrawing from team activities requiring coordinated information processing. In response to conflict-induced threats, members may seek to conserve resources through conflict avoidance (Tjosvold & Sun, 2002). Unfortunately, avoidance of conflict reescalation may result in a further withholding of needed information (Sparrowe, Liden, Wayne, & Kraimer, 2001). Members also may attempt to avoid reescalation of conflict by resisting asking for needed information, even when the most relevant information is available (Labianca, Brass, & Gray, 1998). Given the results of several meta-analytic studies confirming the relationship between team performance and intra-team conflict, we offer no formal proposition in this regard.

Mediating Role of Intra-Team Conflict

However, we propose that the performance benefits of TMS emerge because a TMS prevents the resource losses typical to teams experiencing conflict. In the absence of a TMS, performance suffers, in part, because resources otherwise directed toward task activities must be used to contend with and resolve incompatibilities and tensions between team members engaged in task and relationship conflicts. Thus, we expect TMS to have a positive effect on team performance derived from increased resources available for task completion, and an indirect effect on team performance derived from diminished inter-member conflict.

Proposition 3: The positive relationship between TMS and team performance is mediated by intra-team a) task conflict and b) relationship conflict.

Team Size as a Moderator of the Indirect Effects of TMS on Performance via Conflict

Finally, consistent with the rationale we present above regarding team size as a moderator of the TMS-intragroup conflict relationship, we predict that team size also moderates the indirect effects of TMS on performance as transmitted by task and relationship conflict. Specifically, here we are predicting moderated mediation - or a conditional indirect effect of TMS on team performance (Preacher, Rucker, & Hayes, 207). We theorize the presence of this conditional indirect effect because we expect that the effects of TMS on team performance, through its effects on task and relationship conflict, depend significantly on team size.

TMS facilitates accurate associations between members and expertise areas, encourages members to maintain expertise in unique areas, and helps to minimize the occurrence of conflict caused by overlapping expertise. Thus, we expect that the performance benefits of TMS from diminished task conflict are likely to be stronger in larger teams, in which the coordination costs are more pronounced. In contrast, because TMS increases the transparency of domains of responsibility, the potential loss of face and social recrimination associated with help and information seeking in smaller teams where evaluation potential is heightened is likely to be diminished. Thus, we expect that the performance benefits from diminished relationship conflict are likely to be stronger in smaller teams. From this and our above arguments, we make the following two predictions:

Proposition 4: The positive and indirect effect of TMS on team performance through task and relationship conflict is moderated by team size, such that as team size increases, the indirect effect via a) task conflict becomes stronger, but b) via relationship conflict becomes weaker.

DISCUSSION

Although a great deal of research effort has been separately focused on transactive memory systems and intra-team conflict, little research has focused on the point of intersection between these streams of research. Moreover, the majority of research in the TMS domain has favored an input-process-outcome approach (Ilgen, Hollenbeck, Johnson, & Jundt, 2005); conceptualizing TMS as a mechanism explaining the effects of team inputs on team performance. However, the emphasis on TMS as a process with only direct consequences for team performance has left a void in our understanding of the drivers of this putatively direct relationship. In this manuscript, we sought in part to fill this gap by advancing a theoretical framework explaining both the direct and indirect effects of TMS on team performance, the mediating roles played by intra-team task and relationship conflict, and the role of team size in this process.

Theoretical Implications

We propose that the team performance benefits of TMS emerge at least in part as a consequence of the conservation of resources otherwise expended in unproductive task and relationship conflicts. We conceptualize TMS as a 'meta-resource' that may both increase team resources available for task completion and other productive purposes, while also decreasing the expenditure of resources on unproductive activities such as intra-team conflict. Given this conceptualization, TMS emergence may be a proactive strategy enacted by members to acquire, protect, or prevent the loss of scarce resources (Hobfoll, 1989; 2001). We employ this meta-resource framing to integrate discrete streams of research in the intra-team conflict and TMS areas.

Future research may employ this framing to explore the resource conservation properties afforded through TMS on team processes other than conflict, such as counter-productive work behaviors (Dalal, 2005) or citizenship behaviors (Podsakoff, MacKenzie, Paine, & Bachrach, 2000). In addition, emerging research on the association between affect and TMS (Huang, 2009) suggests that affect, or the tendency to experience positive or negative moods states (Watson, Clark, & Tellegen, 1988), may impact members' willingness or ability to learn what other members know and to coordinate effectively with one another. Future TMS research employing this meta-resource frame should explore positive and negative affect as factors contributing to the ability to mobilize resources to invest in the development and maintenance of the transactive structures and processes inherent to a TMS.

Practical Implications

Our conceptualization of TMS as a meta-resource allows that TMS may be viewed, at least in part, as a consequence of tactical resource investments in the processes and structures that support the maintenance of a directory of 'who knows what' and transactive encoding, storage and retrieval capabilities (Lewis & Herndon, 2011). This conceptualization provides that managers seeking to help teams conserve scarce resources, and thus improve their objective performance, may actively facilitate investments in the processes and structures underlying TMS. Research suggests that members can develop a shared directory from explicit information such as past performance records (Moreland & Myaskovsky 2000), based on perceptions or expectations (Hollingshead & Fraidin 2003), or through inter-member communication regarding task activities. We expect that the structure and transactive processes underlying TMS may be encouraged, practiced, trained and rewarded – and managers focused on the development of these structures and processes may invest resources to help generate them. Managers may reward employees for the development and sharing of explicit member expertise maps that codify the informal domain differentiation characterized by TMS. Managers may provide teams with

information systems software (Maruping & Agarwal, 2004) to facilitate the development of electronic information catalogues that facilitate the movement of new, incoming information to the right member expert.

REFERENCES

Akgun, A. E., Byrne, J., Keskin, H., Lynn, G. S., & Imamoglu, S. Z. (2005). Knowledge networks in new product development process. *Information and Management,* 42: 1105-1120.

Amason, A., & Sapienza, H. (1997). The effects of top management team size and interaction norms on cognitive and affective conflict. *Journal of Management,* 23: 496-516.

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

Balkundi, P., & Harrison, D. A. (2006). Ties, leaders, and time in teams: Strong inference about network structure's effects on team viability and performance. *Academy of Management Journal,* 49: 49-68.

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

Borgatti, S.P. & Foster, P. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management,* 29: 991-1013.

Bourgeois III, L. J. (1981). On the measurement of organizational slack. *Academy of Management review*, 6: 29-39.

Brandon, D., & Hollingshead, A. B. (2004). Transactive memory systems in organizations: matching tasks, expertise, and people. *Organization Science,* 15: 633–644.

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

Carron, A. V., & Spink, K. S. (1995). The group size-cohesion relationship in minimal groups. *Small Group Research*, *26*, 86-105.

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

Choi, S. Y., Lee, H., & Yoo, Y. (2010). The impact of information technology, and transactive memory systems on knowledge sharing, application, and team performance: A field study. *MIS Quarterly*, 34: 855-870.

Contractor, N.S., Wasserman, S., & Faust, K. (2006). Testing multitheoretical, multilevel hypotheses about organizational networks: An analytical framework and empirical example. *Academy of Management Review* 31: 681-703.

Daft, R. L., & Macintosh, N. B. (1981). A tentative exploration into the amount and equivocality of information processing in organizational work units. *Administrative Science Quarterly*, 26: 207-224.

Dalal, R. S. (2005). A meta-analysis of the relationship between organizational citizenship behavior and counterproductive work behavior. *Journal of Applied Psychology*, 90: 1241-1255.

Davis, J. H. (1969). *Group performance*. Reading, MA: Addison-Wesley.

Dayan, M., & Basarir, A. (2009). Antecedents and consequences of team reflexivity in new product development projects. *Journal of Business and Industrial Marketing*, 25: 18-29.

Dayan, M., & Elbanna, S. (2011). Antecedents of team intuition and its impact on new product development projects. *Journal of Production and Innovation Management*, 28: 159-174.

De Dreu, C. K. W. (2006). When too little or too much hurts: Evidence for a curvilinear relationship between task conflict and innovation in teams. *Journal of Management*, 32: 83-107.

De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A Meta-Analysis. *Journal of Applied Psychology*, 88: 741-749.

De Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intra-team conflict: A meta-analysis. *Journal of Applied Psychology*, 97: 360-390.

Dijkstra, M. T. M., Van Dierendonck, D., Evers, A., & De Dreu, C. K. W. (2005). Conflict and well-being at work: the moderating role of personality. *Journal of Managerial Psychology*, 20: 87-104.
Eisenhardt, K. M., & Schoonhoven, C. B. (1990). Organizational growth: Linking founding team strategy, environment, and growth among U.S. semiconductor ventures, 1978-1988. *Administrative Science Quarterly*, 35: 504-529.
Ellis, A. P. J. (2006). System Breakdown: The role of mental models and transactive memory in the relationship between acute stress and team performance. *Academy of Management Journal*, 49: 576-589.
Erickson, B. H. (1988). The relational basis of attitudes. In B. Wellman, & S. D. Berkowitz (Eds.), *Social structures: A network approach*: 99-121. New York: Cambridge University Press.
Faraj, S., & Sproull, L. (2000). Coordinating expertise in software development teams. *Management Science*, 46: 1554-1568.
Harkins, S. G. (1987). Social loafing and social facilitation. *Journal of Experimental Social Psychology*, 23:1-18.
Harkins, S. G., & Jackson, J. M. (1985). The role of evaluation in eliminating social loafing. *Personality and Social Psychology*, 11: 575-584.
Ho, V. T., & Levesque, L. L. (2005). With a little help from my friends (and substitutes): Social referents and influence in psychological contract fulfillment. *Organization Science*, 16: 275-289.
Ho, V.T., & Wong, S.-S. (2009). Knowing who knows what and who knows whom: Expertise recognition, network recognition, and individual work performance. *Journal of Occupational and Organizational Psychology,* 82: 147-158.
Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologis*t, 44: 513–524.
Hobfoll, S. E. (2001). The influence of culture, community, and the nested self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review*, 50: 337–370.
Hollingshead, A. B. (1998). Communication, learning, and retrieval in transactive memory systems. *Journal of Experimental Social Psychology,* 34: 423-442.
Hollingshead, A. B. & Fraidin, S. N. (2003). Gender stereotypes and assumptions about expertise in transactive memory. *Journal of Experimental Social Psychology*, 39: 355-363.
Huang, C.-C. (2009). Knowledge sharing and group cohesiveness on performance: An empirical study of technology R&D teams in Taiwan. *Technovation*, 29: 786-797.
Ickes, W., Dugosh, J. W., Simpson, J. A., & Wilson, C. L. (2003). Suspicious minds: The motive to acquire relationship-threatening information. Personal Relationships, 10: 131–148.
Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology,* 56: 517-543.
Jackson, M., & Moreland, R. L. (2009). Transactive memory in the classroom. *Small Group Research*, 40: 508-534.
Jackson, S. E., & Schuler, R. S. (1985). A meta-analysis and conceptual critique of research on role ambiguity and role conflcit in work settings. *Organizaitonal Behavior and Human Decision Processes*, 36: 16-78.
Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intra-team conflict. *Administrative Science Quarterly*, 40: 256-282.
Jehn, K. A. (1997). A qualitative analysis of conflict types and dimensions in organizational groups. *Administrative Science Quarterly*, 42: 530-557.
Jehn, K. A., Rispens, S., & Thatcher, S. M. B. (2010). The effects of conflict asymmetry on work and individual outcomes. *Academy of Management Journal*, 53: 596-616.
Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of personality and Social Psychology*, 65, 681-706.
Kelley, H.H., & Thibaut, J.W. (1978). *Interpersonal relations: A theory of interdependence*. New York: Wiley-Interscience.

Kerr, N. L., & Bruun, S. E. (1981). Ringelmann revisited: Alternative explanations for the social loafing effect. *Personality and Social Psychology Bulletin*, 71: 224-231.
Korsgaard, M. A., Soyoung Jeong, S., Mahony, D. M., & Pitariu, A. H. (2008). A multilevel view of intra-team conflict. *Journal of Management*, 34: 1222-1252.
Labianca, G., Brass, D. J., & Gray, B. (1998). Social networks and perceptions of intergroup conflict: The role of negative relationships and third parties. *Academy of Management Journal*, 41: 55-67.
Langfred C. (2005). The downside of self-management: A longitudinal study of the effects of conflict on trust, autonomy, and task interdependence in self-managing teams. *Academy of Management Journal*, 50: 885-900.
Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of three dimensions of job burnout. *Journal of Applied Psycology*, 81: 123-133.
Lee, F. (1997). When the going gets tough, do the tough ask for help? Help seeking and power motivation in organizaitons. *Organizational Behavior and Human Decision Processes*, 72 336-363.
LePine, J. A., & Van Dyne, L. (2001). Peer responses to low performers: An attributional model of helping in the context of groups. *Academy of Management Review*, 26 67-84.
Lewis, K. (2003). Measuring transactive memory systems in the field: Scale development and validation. *Journal of Applied Psychology* 88: 587-604.
Lewis, K. (2004). Knowledge and performance in knowledge-worker teams: A longtitudinal study of transactive memory systems. *Management Science* 50: 1519-1533.
Lewis, K., Belliveau, M., Herndon, B., & Keller, J. (2007). Group cognition, membership change, and performance investigating the benefits of detriments of colletive knowledge. *Organizational Behavior and Human Decision Processes,* 103: 159-178.
Lewis, K., & Herndon, B. (2011). Transactive memory systems: Current issues and future research directions. *Organization Science*, 22: 1254-1265.
Lewis, K., Lange, D., & Gillis, L. (2005). Transactive memory systems, learning, and learning transfer. *Organization Science,* 16: 581–598.
Liang, D.W., Moreland, R., & Argote, L. (1995). Group versus individual training and group performance: The mediating role of transactive memory. *Personality and Social Psychology Bulletin* 21: 384-393.
Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communications perspective. *Academy of Management Journal*, 44: 779-793.
Maruping, L. M., & Agarwal, R. (2004). Managing team interpersonal processes through technology: a task-technology fit perspective. *Journal of Applied Psychology,* 89: 975–990.
Michinov, N. & Michinov, E. (2009). Investigating the relationship between transactive memory and performance in collaborative learning. *Learning and Instruction*, 19: 43-54.
Moreland, R.L. (1999). Transactive memory: Learning who knows what in work groups and organizations. In L. Thompson, D. Messick, J. Levine, (Eds.), *Shared cognition in organizations: The management of knowledge*: 3-31. Mahwah, NJ: Erlbaum.
Moreland, R.L., Argote, L., & Krishnan, R. (1996). Socially shared cognition at work: Transactive memory and group performance. In J.L. Nye, A.M. Brower, (Eds.), *What's social about social cognition? Research on socially shared cognition in small groups*: 57-84. New York: Plenum Press.
Moreland, R.L., Argote, L., & Krishnan, R. (1998). Training people to work in groups. In R.S. Tindale, L. Heath, (Eds.), *Theory and research on small groups: Social psychological applications to social issues*: 37-60.
Moreland, R.L., & Myaskovsky, L. (2000). Exploring the performance benefits of group training: Transactive memory or improved communication? *Organizational Behavior and Human Decision Processes* 82: 117-133.
Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126: 247-259.

Nelson, J., & Aboud, F. E. (1985). The resolution of social conflict between friends. *Child Development,* 56: 1009-1017.
Nooteboom, B. (2000). Learning by interaction: absorptive capacity, cognitive distance and governance. *Journal of Management and Governance*, 4: 69-92.
Oh, H., Chung, M., & Labianca, G. (2004). Group social capital and group effectiveness: The role of informal socializing ties. *Academy of Management Journal*, 47: 860-875.
Palazzolo, E.T. (2005). Organizing for information retrieval in transactive memory systems. *Communication Research* 32: 726-761.
Palazzolo, E.T., Serb, D.A., She, Y., Su, C., & Contractor, N.S. (2006). Coevolution of communication and knowledge networks in transactive memory system: Using computational models for theoretical development. *Communication Theory* 16: 223-250.
Pelled, L. H. (1996). Demographic Diversity, Conflict, and Work Group Outcomes: An Intervening Process Theory. *Organization Science*, 7: 615-631.
Peltokorpi, V., & Manka, M. L. (2008). Antecedents and the performance outcome of transactive memory in daycare work groups. *European Psychologist,* 13: 103–113.
Podsakoff, P. M., MacKenzie, S. B., Paine, J. B., & Bachrach, D. G. (2000). Organizational citizenship behaviors: A critical review of the theoretical and empirical literature and suggestions for future research. *Journal of Management,* 26*:* 513-563.
Pondy, L. R. (1967). Organizational conflict: Concepts and models. *Administrative Science Quarterly*, 12: 296-320.
Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research,* 42*:* 185–227.
Rau, D. (2005). The influence of relationship conflict and trust on transactive memory: Performance relation in top management teams. *Small Group Research*, 36: 746-771.
Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly*, 48(2): 240-267.
Ren, Y., & Argote, L. (2011). Transactive memory systems 1985-2010: An integrative framework of key dimensions, antecedents, and consequences. *Academy of Management Annals*, 5: 189-229.
Ren, Y., Carley, K.M., & Argote, L. (2006). The contingent effects of transactive memory: when is it more beneficial to know what others know? *Management Science* 52: 671-682.
Rusbult, C. E., & Van Lange, P. A. M. 2003. Interdependence, interaction, and relationships. *Annual Review of Psychology,* 54: 351-375.
Shah, P.P., Dirks, K.T., & Chervany, N. (2006). The mmultiple ppathways of high performing groups: The interaction of social networks and group processes. *Journal of Organizational Behavior*, 27, 299-317.
Shaw, J. D., Zhu, J., Duffy, M. K., Scott, K. L., Shih, H., & Susanto, E. (2011). A contingency model of conflict and team effectiveness. *Journal of Applied Psychology*, 96: 391-400.
Simon, H. A. (1957). *Models of Man*. New York: Wiley.
Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intra-team trust. *Journal of Applied Psychology*, 85: 102-111.
Sparrowe, R. T., Liden, R. C., Wayne, S. J., & Kraimer, M. L. (2001). Social networks and the performance of individuals and groups. *Academy of Management Journal,* 44: 316-325.
Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly,* 26: 501-524.
Swann, W. B. Jr., Polzer, J. T., Seyle, D. C., & Ko, S. J. (2004). Finding value in diversity: Verification of personal and social self-views in diverse groups. *Academy of Management Review*, 29: 9-27.
Tjosvold, D., & Sun, H.F. (2002). Understanding conflict avoidance: Relationship, motivations, actions and consequences. *International Journal of Conflict Management*, 13: 142-164.
Tynan, R. (2005). The effects of threat sensitivity and face giving on dyadic psychological safety and upward communication. *Journal of Applied Social Psychology,* 35: 223-247.

Watson, D., Clark, L.A. and Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology,* 54: 1063-70.

Wegner, D. M., Giuliano, T., & Hertel, P. T. (1985). Cognitive interdependence in close relationships. In W. Ickes (Ed.), *Compatible and incompatible relationships*: 253-276. New York: Springer-Verlag.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen, G. R. Goethals, (Eds.), *Theories of group behavior*: 185-208. New York: Springer-Verlag.

White, J.B., Tynan, R., Galinsky, A., & Thompson, L. (2004). Face threat sensitivity in negotiation: Roadblock to agreement and joint gain**.** *Organizational Behavior and Human Decision Processes,* 94:102–124.

Weiner, B. (1980). A cognitive (attribution)-emotion-action model of motivated behavior: An analysis of judgment of help-giving. *Journal of Personality and Social Psychology* 39: 186-200.

Weiner, B. (1985). An attributional theory of achievement of motivation and emotion. *Psychological Review*, 92, 548-573.

Wiersema, M. F., & Bantel, K. A. (1992). Management team demography and corporate strategic change. *Academy of Management Journal,* 35: 91-121.

Zhang, Z., Hempel, P. S., Han, Y., & Tjosvold, D. (2007). Transactive memory system links work team characteristics and performance. *Journal of Applied Psychology,* 92: 1722-1730.