Liviu Florea, Michael Stoica*

Exploration of Team Mental Model Characteristics to Identify Opportunities and Hindrances in Global Virtual Teamwork**

Abstract

While there is a significant volume of literature that studies teamwork, the research in virtual teams and global virtual teamwork is still developing. The current research acknowledges the popularity of virtual teamwork in today's organizations and sheds light on the differences between global virtual and other forms of teamwork using different features of the team mental model. Compared to traditional or face-to-face teams, global virtual teams can usually achieve more significant team process gains, suggesting the existence of opportunities, while disengagement might lead to losses, indicating potential hindrances.

This research aims to identify particular features of global virtual teamwork and ways in which they impact performance, using the concept of team mental model. The model is conceptualized as teams' thought processes reflected in their members common knowledge. We examine the concept of team mental model in the form of cohesiveness, task abilities, and social loafing. We propose that virtual teams' cohesiveness can present both opportunities and hindrances for team performance, promoting performance orientation, stimulated by the use of communication and collaboration technologies, while potentially hurting outcomes depending on the level of individualistic value orientations or anti-work norms are prevalent within the team. We also propose that global virtual teams benefit from epistemic opportunities because they have access to wide-ranging and far-reaching perspectives generated by diverse team members, as well as knowledge heterogeneity and within team cross-learning potential. Conversely, motivational losses in the form of social loafing and trust development hinder processes and outcomes of global virtual teamwork.

Keywords: virtual teamwork, cohesiveness, abilities, social loafing
(JEL: M12, M16, M59)

* Liviu Florea, Associate Professor, School of Business, Washburn University, (310L Henderson Learning Center), 1700 SW College Avenue, Topeka, Kansas 66621, USA, ph. +1 785 670 1603, E-mail: liviu.florea@washburn.edu, https://washburn.edu/our-faculty/liviu-florea.
Michael Stoica, Professor, School of Business, Washburn University, 1700 SW College Avenue, Topeka, Kansas 66621, USA, E-mail: michael.stoica@washburn.edu, https://washburn.edu/our-faculty/michael-stoica.

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Introduction

Globalization of business, products, and markets has led to rising popularity of virtual teamwork, telework, and computer-mediated communication. As more organizations embrace virtual teamwork, practitioners and researchers need to recognize that virtual teams face different challenges than those faced by teams whose members meet face-to-face. Differences arise from the circumstance in which team members do not share the same geographical location and, accordingly, have to communicate and collaborate virtually. In addition, different members of the same virtual team may have different knowledge opportunities, network positions, and relationship commitment. Global virtual team members tend to have different abilities, motivations, behaviors, attitudes, and devotion to completing team objectives. Many of these differences can be persistent and require more time to form and identify a modus vivendi that is effective, efficient, and acceptable to all team members.

The focus of this paper is the global virtual team mental model that reflects teams' cognitive, affective and motivational states (Marks et al., 2001). Team mental model construct captures characteristics of team interactions and team members' inclinations to engage in three of the 'big five' teamwork behaviors identified by Salas et al. (2005). These three important behaviors for the interaction and collaboration within teams are: a) mutual performance monitoring and awareness of individual and team progress toward the achievement of teams' goals; b) mutual task-related support of team members; and c) continuous adaptation of team efforts to changing demands of team activities.

Consistent with the teamwork literature, we analyze team mental model both as the teams' psychological trait and emergent state, seen as either input or proximal outcome. Correspondingly, this construct encapsulates team members' capabilities that amount to the psychological trait, cohesiveness (that is the affective characteristic of the emergent state), and the motivational characteristic of social loafing.

We organize this article as follows. First, we identify differences between face-to-face and virtual teamwork. Then, we discuss team mental model, its relationship with team cohesiveness, members' capabilities, and potential for motivational losses in global virtual teams, and its impact on performance. Then, we assess team mental model differential impact on global virtual teams and traditional, face-to-face teams. Finally, we discuss hindrances and opportunities in the context of virtual teamwork.

Face-to-face and Global Virtual Teamwork Differences

Face-to-face and Global Virtual Teamwork

Teams, defined as groups of two or more people who work interdependently over time to accomplish common goals related to a task-oriented purpose, are prevalent

in todays' organizational environment. Team members interact frequently and depend on each other for critical information and actions needed to achieve common goals.

Virtual teams are interdependent groups that work across time, space, and organizational boundaries (Hambley et al., 2007). Although most virtual team members do not share the same location, they can work interdependently by using communication and collaboration technologies, such as e-mail, instant messaging, social media, web conferencing, and document sharing (Lacerenza et al., 2015). In addition to being geographically dispersed, sometimes all over the world (Kirkman et al., 2012), these teams include members who do not necessarily share the same culture. Building upon research on evolutionary form of network organizations, Jarvenpaa and Leidner (1998, p.1) suggest that 'the concept of virtual implies permeable interfaces and boundaries […] and individuals with different competencies who are located across time, space, and cultures.'

Over the past three decades, virtual team working has become commonplace and tends to be widely used to organize activities in many organizations. Closely following distributed expertise, increased need for efficiency, and developing collaboration technologies, virtual teamwork has become critical to performance in organizations (Dulebohn & Hoch, 2017). Virtual teams bring the potential of enhanced flexibility, responsiveness, lower costs, and improve resource utilization (Jarvenpaa & Leidner, 1998). In some organizations, many employees are no longer conducting all of their work face-to-face, but resort to electronic conversation, document distribution and even shared online communal space (Hanebuth, 2015; Boughzala et al., 2012).

We use the term global virtual teams to refer to virtual teams that can include team members from all over the world. Recent studies document collaboration in these teams, showing that 60 percent of managers are often members of virtual teams and tens of millions of virtual teams operate worldwide (Shea et al., 2011). Moreover, a survey of 1372 business participants from 80 countries revealed that 85 percent of the respondents work on virtual teams – 63 percent of the respondents work on one to three virtual teams, 22 percent work on at least four virtual teams (RW^3 Culture Wizard, 2016). Almost 20 percent of the respondents spend over half of the day interacting in virtual teams and 48 percent indicate that more than half of their virtual team members are from other nations (RW^3 Culture Wizard, 2016).

Anecdotal evidence suggests that, despite its increasing popularity, global virtual teamwork may be affected by lower individual commitment than face-to-face teamwork, as well as role overload, role ambiguity, absenteeism, and social loafing. Due to cultural and linguistic differences and trust underdevelopment, communication, interaction and cooperation of global virtual team members may be impaired (Dossick et al., 2014). Global virtual team activities and behaviors are also influenced by the nature of the media utilized for communication and increased complexity of team members' coordination (Schmidtke & Cummings, 2017). Consequently,

global virtual teams may face ambiguity and uncertainty, and struggle to develop a shared understanding of how to accomplish their tasks.

Suggestion to the Editor: Since the manuscript makes reference to Figure 1 only at the end of the next paragraph, can we move the next paragraph before Figure 1: Advantages (+) and disadvantages (-) of global virtual teamwork?

Figure 1. Advantages (+) and disadvantages (-) of global virtual teamwork

Correction: There are three sections in Figure 1. Please switch the contents of the second section, from one column to the other. In the second section of Figure 1, under 'Team homogeneity and likelihood that teams perform at full potential fast,' please move the content from the first column (up to "cultural and linguistic differences and trust underdevelopment may impair communication, interaction and coordination)" to the second column, and the content of the second column ("enhanced flexibility, lower costs, increased responsiveness, and improved resource utilization" and "different competencies can facilitate creativity and more thorough decision-making") to the first column. Only the middle section of Figure 1, not the first nor the last section should have their content reversed.

Global virtual teamwork may also be affected by prolonged communication and delayed coordination, depending on whether the interaction between members is synchronous or asynchronous. According to media synchronicity theory (Dennis et al., 2008), media vary in their conveyance (i.e., capacity to transmit information) and convergence (i.e., ability to process information). Conveyance may be high in synchronous interactions, such as videoconferencing, while convergence may be high in asynchronous virtual interactions, such as e-mail. In synchronous interactions, information transmission capabilities are high since the transfer of information is rapid, but information-processing capabilities are likely slow. The opposite is true in asynchronous virtual interactions since the processing of information is fast, but information is unlikely to be accessed immediately. Advantages (+) and disadvantages (-) of global virtual teamwork, when compared to face-to-face teamwork, and related to geographic location, team homogeneity and data and information available are summarized in Figure 1.

Teamwork Process Differences and Implications

Teamwork includes five activities and behaviors important to achieve a common goal: (1) mutual performance monitoring, (2) back-up behavior, (3) adaptability, (4) leadership and (5) team orientation (Salas et al., 2005). Essential for team interaction and interdependency, the first three behaviors involve, respectively: awareness of team members' progress on their tasks while completing one's own work, providing additional resources (e.g., time, capability) to team members when the task assignments are beyond their capacity, and recognition of and adjustment to changes. A construct that captures team members' propensities to engage in these actions and behaviors, as well as team interaction and interdependency is team mental model.

The team mental model (TMM) can be thought of as emergent states that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes (Marks et al., 2001). Emergent states are not the same as team processes. They can be considered as both 'inputs and proximal outcomes' (Marks et al., 2001, p.358). As emergent states, mental models describe shared internal repre-

sentations of knowledge that accurately capture the complexity of context, inputs and outcomes. They are the result of team members' interactions and sharing of common experiences and go beyond the aggregation of individual team members' cognitions to create a mutual belief or understanding (Nonose et al., 2010).

Using the commonly accepted input-process-output framework of teams (Gladstein, 1984), a meta-analytic review of team research (Stewart, 2006) ascertains team mental model as a psychosocial trait that is influenced by design characteristics, such as team composition and task features (i.e., inputs). The framework also ascertains that TMM has a strong impact on team performance (i.e., output) and processes, such as communication and conflict. TMM includes the team-focused model, related to skills of the team members, how works needs to be accomplished and describing interpersonal interaction requirements, as well as the task-focused model, related to what needs to be accomplished, in the form of work goals and performance requirements. TMM does not include other forms of shared team cognition, such as team situation awareness, transactive memory, defined as shared store of knowledge (Wegner, 1995), group learning, and strategic consensus. It captures implicit coordination observed in effective teams and is commonly considered a precursor to effective team processes and performance.

Rouse et al. (1992) assert that TMM permits team members to interpret information similarly, share expectations regarding future events, and develop similar causal accounts for a situation. Hence, it allows team members to be on the same page, sharing the same description, prediction and explanation of the team situation. For instance, team members explain in the same way what is observed, know what to expect, and anticipate what other team members want and need, which permits the team to coordinate action and adapt behavior to task demands, enabling better decision-making and higher performance (Mathieu et al., 2000). Two important characteristics of TMM are similarity and accuracy. Similarity is the sharing of similar, consistent, converging and/or compatible individual mental models among the team members leading to common expectations for the task and team (Mathieu et al., 2000). Accuracy reflects the degree to which TMM mirrors the 'true state of the world' (Edwards et al., 2006, p. 728) and may yield, in combination with similarity, team performance benefits.

Our objective is to identify differences between face-to-face and global virtual teamwork and to pinpoint global virtual teamwork opportunities and hindrances. To achieve this objective we focus on TMM in the broader context of the input-process-output (IPO) model, proposed by Gladstein (1984) to the context of traditional, face-to-face teams, then, developed by Webster and Staples (2006), and, ultimately, adapted by Dulebohn and Hoch (2017) to the context of virtual teamwork.

The IPO model identifies team inputs, including design factors, such as norms and autonomy; team size, knowledge, values and cultural orientation, personality traits and composition, representing both surface level and deep level diversity; and team

roles, including specific skills and leadership. According to the IPO model, these inputs influence cognitive processes, motivational characteristics (such as teamwork engagement), affective characteristics (such as cohesiveness), and behavioral characteristics (such as leadership, communication and technology usage). The final component of the IPO model, team outputs, includes team level and individual member performance outcomes. Outputs are influenced by team inputs, through the mediational path of processes, and by moderators, such as virtuality, interdependence, task complexity, and team context, including legal environment.

Team characteristics influence processes that occur between team members, as they move toward the accomplishment of their task-related objectives. These characteristics also influence team performance, explained as both team effectiveness, seen as the capability to achieve team objectives, and team efficiency that encapsulates the individual team members' collective competence (Bitencourt & Bonotto, 2010) and productivity. Therefore, teamwork performance is influenced both directly by team processes and indirectly by team characteristics. The direct influence occurs through team processes such as activities and interactions. The indirect influence occurs because of team characteristics through the mediational path of team processes. The IPO model includes a feedback loop in the form of adaptive and adjusting effects of outcomes that influence ongoing inputs and processes.

TMM can arguably provide a useful context for describing components of the IPO model and comparing their impact in face-to-face and global virtual teams. TMM can help delineate team activities, such as interactions, participation, and synthesis, and includes mutual discovery, critical engagement, knowledge exchange, and resolution (Dossick et al., 2014).

Face-to-face and global virtual teams share many characteristics . The IPO model helps identify important differences in performance implication between the two types of teams. One difference is related to the degree of virtuality that influences communication and information sharing within teams and their impact on performance. Marlow et al., (2017) propose that the more a team relies on virtual tools to communicate (i.e., the larger the degree of virtuality), the more complex TMM is, leading to more time to complete tasks, as well as to lower performance. However, Marlow et al. (2017) suggest that this relationship is moderated by familiarity. The negative effect of virtuality on the time needed to complete tasks and team performance is mitigated in the presence of shared cognition between team members even when they exchange less information. They also propose that virtuality boosts the negative relationship between frequent communication and team processes and outcomes, as well as the relationship between communication timeliness and performance. On the other hand, it mitigates the positive impact of team cognition on performance, referred to as information shared by team members relating to the task. The relationship between communication and performance is also proposed to

be stronger in virtual teams with team members who are more interdependent and complete more difficult tasks.

Focusing on culture and virtuality, Kramer et al. (2017) propose that teams characterized by individualism and masculinity are more likely to rely on virtual tools that are asynchronous and high in task-related informational value. Among individualistic teams, teams with vertical-individualistic members (that favor own goals and emphasize status differences) tend to rely on virtual tools, accept forms of informational value, and comply with asynchronous methods of communication, as opposed to horizontal-individualistic teams that comply with synchronous methods. Teams characterized by vertical collectivism (that favor in-group members and accept perceptions of inequality) tend to limit reliance on virtual tools, accept forms of informational value, and comply with asynchronous methods, as opposed to teams characterized by horizontal collectivism that comply with synchronous methods. Kramer et al. (2017) also propose that teams characterized by high power distance and high-uncertainty avoidance tend to leverage tools with high informational value and high synchronicity, while teams characterized by long-term orientation favor asynchronous tools, but are generally slower to rely on virtual tools than teams characterized by short-term orientation. They also propose that low-context teams characterized by neutrality rather than teams characterized by affectivity, as well as tight teams rather than loose teams, tend to rely on virtual tools with low informational value.

Just like any team members, individual members of global virtual teams experience task interdependence in working toward shared goals. Some authors argue that global virtual teams experience more losses and perform poorer than face-to-face teams. One explanation for this tendency may be that teamwork, including the coordination of team activities, becomes more challenging as the degree of virtuality increases. Schmidtke and Cummings (2017) suggest that three central teamwork behaviors, mutual performance monitoring, backup behavior and adaptation, turn out to be less effective in global virtual teams than they are in face-to-face teams.

However, global virtual teamwork may have considerable benefits. They are driven by the diversity of members' perspectives; opportunities to combine varied resources; and autonomy that refers to team members' perception of the responsibility granted to the team as a whole. The autonomy is likely to allow for increased synergy and innovation, and promotes more desirable team outcomes.

One important characteristic that differentiates global virtual teams is task visibility. It is defined in Kidwell and Bennett (1993) as team members' belief that others are aware of their efforts. As tasks in global virtual teams are less visible, members of these teams may deem their efforts as less noticeable and, therefore, less sanctioned, encouraging some of them to choose 'to hide in the crowd' (Latané et al., 1979). Therefore, these individuals may be less motivated to work hard for the team because of lower expectancy, instrumentality and valence, as specified by the expectan-

cy theory of motivation (Vroom, 1964). Working from remote locations may obscure the relationship between their effort and performance, therefore lowering their expectancy. Moreover, the performance-outcome relationship may be hindered in global virtual teams, therefore reducing team members' instrumentalities, as well as dropping the number and attractiveness of these outcomes and clouding valences. In support of this theoretical explanation of the visibility effects, Williams and Karau (1991) find that individual perception of the strength of the performance-outcomes relationship is negatively related to task contributions. Similarly, George (1992) suggest that individuals are less likely to work hard when their effort is less visible and distinguishable.

Potentiating the effect of task visibility, global virtual teamwork happens in an environment with higher uncertainty, which may broaden the scope of opportunistic behavior. Virtual teams are likely to face clarity- and consensus-hindrances due to team members' different cultural backgrounds, as well as variations in proficiency level that can create communication, trust and coordination barriers (Gibbs, 2009). Querying the effectiveness of virtual teams, Handy (1995, p. 46) reasons that 'trust needs touch' since only trust can prevent geographical distances and organizational distances of global team members from becoming psychological distances (Jarvenpaa, & Leidner, 1998). While we disagree with Handy's (1995) assessment that trust may not be possible in global virtual teams, we acknowledge that the trust development is contingent on the degree to which team members act predictably and provide quality contributions, engage in open and thoughtful exchange of information, and provide timely and detailed accounts of the work performed. The trust development is more difficult in global virtual teams than in face-to-face teams. Noting the lack of shared social context, Jarvenpaa and Leidner (1998) suggest that global virtual teamwork may experience, in the best-case scenario, a fragile and depersonalized 'swift' trust, which has to be continuously facilitated by social exchange and strengthened by action in a self-fulfilling manner in order to be effective.

Two important dimensions that shape teamwork are culture and technology. Culturally, team members tend to be valued more for their willingness to access and share information with the team and less for what they know, owing to growing volume of information and various ways to access it (Brill, 2016). Technologically, new capabilities to share information have been developed, facilitating and encouraging collaboration within global virtual teams. Today's media based on the multitude of information and communication technologies, synchronous and asynchronous, richer and poorer may not straighten out communication-related obstacles and may preclude global virtual teamwork from being as effective as face-to-face teamwork (Hambley et al., 2007; Jarvenpaa & Leidner, 1998). Therefore, managing interaction and cooperation may be more challenging in global virtual teams than in co-located, face-to-face teams. These limitations can inhibit team cohesive-

ness, knowledge sharing and team performance (Klitmoller & Lauring, 2013), and stifle engagement, leading to social loafing.

Team Mental Model in Global Virtual Teamwork

Teamwork research (e.g., Klimoski & Mohammed, 1994) notes that TMM is dynamic in nature and describes interactions between team members. It captures members' shared interpretations of knowledge and beliefs as well as teams' implicit coordination, adaptation, shared causal accounts and expectations (Rouse et al., 1992). In different strings of research, TMM has been analyzed as an input (e.g., Marks et al., 2001); a psychosocial trait influenced by task and team design (e.g., Stewart, 2006; Cohen & Bailey, 1997); an emergent state, different than team processes (e.g., Dulebohn & Hoch, 2017; Nonose et al., 2010); and a proximal outcome (e.g., Hambley et al., 2007; Marks et al., 2001; Maznevski & Chudoba, 2000). TMM includes teams' cognitive properties, motivations, affective characteristics and behavioral tendencies (Dulebohn & Hoch, 2017) and consists of team-focused model and task-focused models (Klimoski & Mohammed, 1994) that have performance implications.

We focus on three TMM attributes: (1) cohesiveness, which is an affective characteristic of TMM seen as an emergent state; (2) task and team capabilities, interpreted as the factors that influence TMM seen as a psychosocial trait; and (3) social loafing that describes the motivational characteristics of TMM seen as an emergent state.

Cohesiveness, the Affective Component of the Team Mental Model

For a number of reasons, including building trusting relationships, virtual team members can develop strong emotional bonds to the team. This emotional attachment, called cohesiveness may emerge as a state of the team that fosters a high level of commitment to the team. Man and Lam (2003) refer to cohesiveness as the team members' attraction to their team, as well as motivation to maintain team membership. Carron et al. (1998) define cohesiveness as a dynamic process reflected in the tendency for the team members to stick together and remain united in the pursuits of teams' instrumental objectives and/or satisfaction of member affective needs. That is, cohesiveness captures the idea of team members' 'togetherness,' degree to which team members 'stick together' and are 'bonded' to each other. The commitment of team members to completing team tasks accompanies cohesiveness. Most likely, this commitment is affective (i.e., team members feel attracted to the team), but can also be normative (i.e., team members feel responsible to continue with the team) or continuance (i.e., team members are incentivized to remain with or disincentivized to leave the team).

Cohesiveness has a further significance in the context of global virtual teamwork because it may influence team performance in differing ways (Webster & Wing-Fai,

2017). On one hand, cohesiveness tends to promote higher levels of performance. Rationale for the strong relationship between cohesiveness and team performance has been extensively documented in the literature. For example, Karau and Hart (1998) find that members of highly cohesive groups work equally hard collectively as they did individually. Potentially enabling cohesiveness, conformity to the team norms stimulates team members' performance orientation and, consequently, team performance. Members of cohesive teams benefit from enhanced coordination among them and investment of passion (Webster & Wing-Fai, 2017), which can have positive performance implications.

Furthermore, global virtual teams may be more cohesive because they tend to be more diverse. Research studies have shown that inputs such as personality characteristics of team members (Barrick et al., 1998), diversity and training have the potential to positively impact team performance. Stahl et al. (2010) argued that virtual teams may be more cohesive than face-to-face teams because cultural diversity is positively related to satisfaction with the team, which is a dimension of cohesiveness.

The effect of cohesiveness on global virtual team performance can be also detrimental. Just as conformity to team norms and coordination among members can positively influence team performance, conformity to anti-work norms can have a negative influence on team performance. Team performance can be negatively impacted by a) groupthink, when the desire for conformity and conflict-avoidance results in dysfunctional decision-making outcomes; b) groupshift, when initial positions of the team members are exaggerated toward a more extreme position, as the shared risk makes the individual risk less; and c) social loafing, when some team members may exert less effort.

Given that team members work apart and may have less immediate social reinforcement for commitment and trust, global virtual teams may be less cohesive than other teams. In support of this assessment, Johnson et al. (2009) suggest that the development of shared team identity is precluded by the lack of shared context and that virtual interaction tends to be associated with negative affective commitment.

Cohesiveness is the affective characteristic of TMM that occurs when team members develop strong emotional bonds to other team members and to the team itself (Man & Lam, 2003). Just like team processes, emergent states are the result of team members' cooperation and denote cognitive properties of the team. Unlike team processes, emergent states can be considered either inputs or proximal outcomes. For example, incohesive teams (an input) may be less willing to manage conflict, which may lead to more conflict that reduces cohesiveness (a proximal outcome) even more (Marks et al., 2001).

As an input, cohesiveness is the extent to which team members are attracted to the team and motivated to maintain their team membership (Johnson et al., 2009). If

we presume familiarity between team members, in the form of knowing each other, cooperating, sharing experiences or working together before, the degree of virtuality in team interaction is unlikely to make a difference with regard to cohesiveness. When team members are acquaintances, cohesiveness should be similar in global virtual teams and in face-to-face teams. Even in non-acquaintance conditions, when team members had not known each other before they joined the team, there is, likely, little difference between forming opinions about others in face-to-face interactions or virtually. Information technologies allow people to talk, see, and get to know each other in similar ways in which they would interact if they share the same room (Malhotra & Majchrzak, 2014; Shaw et al., 2007). Geographic distances and time differentials may not necessarily have affective implications. Team members still feel the same toward each other and experience similar levels of attraction to each other.

Proposition 1: Cohesiveness, seen as an input to TMM is similar and has comparable performance implications, in both global virtual teams and face-to-face teams.

Cohesiveness, as a proximal outcome, describes the team's ability to coordinate and adapt action, which are sine-qua-non conditions and direct precursors of superior team performance. Rather than an input emergent state, Maznevski and Chudoba (2000) consider team cohesiveness as an outcome that indicates the extent to which team members enjoy working together and like to continue working together.

When performing team activities, team members interact and share common experiences, shaping the cognitive properties of the team. In the process, they may create mutual beliefs or understandings and share the same team identity (Nonose et al, 2010). If they know each other, their communication, interaction and cooperation may not be impaired by geographic distance. However, in non-acquaintance circumstances, global virtual teamwork can be affected by cultural and linguistic differences, misunderstanding and miscommunication (Jarvenpaa & Leidner, 1998; Dossick et al., 2014).

The longer global virtual team members work together, the more teamwork hindrances can occur. While cohesiveness as an input emergent state is less likely to be affected by these hindrances, cohesiveness as a proximal outcome can be influenced by divergent beliefs, contradictory values and dissimilar understandings of events or factors. Virtual interaction provides fewer opportunities and ways to address and resolve these differences in beliefs, values or understandings.

Proposition 2: In global virtual teams, cohesiveness, seen as a proximal outcome TMM is inferior to that of face-to-face teams and depresses performance.

Cohesiveness, as the affective experience of the team mental model, is deemed to be a direct precursor of team processes. Marks et al. (2001) consider team processes to

be interdependent acts that covert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward interaction and organizing task work to achieve collective goals. Distinct from team processes, cohesiveness is not a description of the nature of team members' interaction, but, rather, the condition that sets the tone for the interaction and team members' interdependent work. Cohesiveness includes feelings and thoughts that coalesce in the minds of team members, developing a TMM that allows team members to find a modus operandi for the team. Afterwards, TMM shapes team processes, in the form of interaction and cooperation that are specific to team members working together. Accordingly, cohesiveness can be viewed as an affective characteristic of TMM and an emergent state that is not necessarily a proximal outcome because it is less relevant for the team effectiveness and it only influences outcomes indirectly through team processes such as leadership or communication. It may not be automatically viewed as an input because it goes beyond initial encounters and attraction between team members to include feelings and thoughts developed by team members who have worked together.

As an emergent state that characterizes dynamic properties of the team including attitudes, values, cognitions, and motivations (Marks et al., 2001), cohesiveness summarizes the degree to which team members are on the same page, explaining what is observed and knowing what to expect (Mathieu et al., 2000). Team members can develop and share observations and expectations similarly in face-to-face and global virtual teams. Information technologies allow exchange of information and access to knowledge for all members of global virtual teams. Given technological advancements, there is no reason that would preclude global virtual team members from accessing similar information and sharing opinions and expectations with their teams.

Proposition 3: *Cohesiveness, seen as an emergent state that precedes team processes, is similar and has comparable performance implications in both global virtual and face-to-face teams.*

Task and Team Capabilities, the Team Mental Model as the Psychological Trait

Global virtual teams often benefit from abilities, skills, experience, knowledge, expertise and other resources of team members who are geographically dispersed. Capabilities of team members influence global virtual teams' outcomes. Among critical abilities for well-functioning global virtual teamwork, Gibson and Cohen (2003) identify cognitive abilities; virtual communication based on the use of communication and collaboration technologies; specific teamwork abilities including establishing team norms and conflict management; cultural sensitivity; self-management; and trust building.

There is a lot of evidence pointing to the importance of cognitive abilities, especially general cognitive ability for team performance. For example, meta-analytic research

(Devine & Philips, 2001; Stewart, 2006) suggests that smarter teams tend to perform better because teamwork is quite complex and demanding. While involved in different aspects of team tasks, team members develop specific knowledge and abilities, interact with one another, and combine their individual efforts to accomplish team goals. The more important learning and development within the team turn out to be, the more critical members' cognitive abilities become (LePine, 2003). Cognitive ability has a strong influence on team performance because team members are less involved in routine tasks and have to learn more from one another to adjust to unforeseen change (LePine, 2005).

Alongside adequate cognitive abilities, mastery of technical abilities related to information and communication technologies, such as trend data and visual display is a necessary condition for effective global virtual teamwork. Collaboration technologies, including web-based meetings and videoconferencing are common occurrences in virtual team environments. Instant messaging apps help team members connect with each other in real time. Emerging technologies such as virtual reality and augmented reality can further facilitate virtual teamwork. Global virtual teams tend to generate creative solutions and make fast decisions because they avoid delays in waiting for periodic face-to-face meetings. In companies like IBM, anecdotal evidence suggests that communication and collaboration technologies stimulate innovation. Since they rely on information and communication technologies, global virtual teams may also develop their cohesiveness. Malhotra and Majchrzak (2014) suggest that global virtual teams perform better by focusing on the manner in which they use technologies, rather the degree of reliance on technologies or the extent of using these technologies.

In addition to cognitive and technical abilities, the concept of team situational awareness (Burke et al., 2006) is critical for team members' abilities to use communication and collaboration technologies, as well as for the team performance. Team situational awareness is the understanding of complex and dynamic situations in the team environment and serves as a mechanism for implicit coordination (Malhotra & Majchrzak, 2014). It facilitates team performance by expediting team cross-learning, constraining or fostering discussion of viewpoints (Burke et al., 2006), environmental cues and their interpretation by team members. Malhotra and Majchrzak (2014) analyzed two representations of this concept: presence awareness, defined as real-time knowledge of team members' availability and accessibility, as relevant for the team tasks, and task knowledge awareness, defined as updated knowledge of each team member's work progress and task responsibilities to facilitate performance.

Not surprisingly, members of global virtual teams that experience high levels of situational awareness, especially presence awareness, tend to interact more effectively and perform better. Indeed, members of global virtual teams who use instant messaging, electronic whiteboard, synchronous application sharing and other similar

technologies that facilitate immediate interactions report higher presence awareness (Shaw et al., 2007). Members of global virtual teams who emphasize effective use of documents in teams' repository, including electronic annotation and sharing of alternative evolving perspectives are more likely to report higher task knowledge awareness (Lowry et al., 2009).

Interpersonal abilities play an important role in teamwork and contribute, together with situational awareness and cognitive and technical abilities, to the shaping of the team-level construct referred as 'task and team capabilities'. This construct is further analyzed, as part of the team mental model seen as a psychological trait.

TMM can be conceptualized as a psychological trait (Cohen & Bailey, 1997), not only as an emergent state. As a psychological trait, TMM is a snapshot, a static view representing shared understanding and beliefs. This static view is the result of the make of the team, combining design factors such as size, demographics, and diversity that shape team composition. It includes both team-focused models, related to the skills of team members that describe how team members work interdependently, and task-focused models, related to the autonomy and interdependence that explain what it is that team is doing (Marks et al., 2001). Both of them depend on critical, though different, team member competences and create conditions for effective team performance.

It is usually possible to select judiciously design characteristics that shape psychological states to such an extent that global virtual teams have qualified team members for each specific team task. The selection of these team members can rely on the degree to which they have the team and task skills and abilities that are relevant to the team tasks. These skills and abilities coalesce, forming collective competences (Bitencourt & Bonotto, 2010) that allow the team to work effectively.

Global virtual teams benefit from a larger pool of worldwide qualified candidates for team membership than face-to-face teams. That can facilitate better team coordination and performance, consistent with the 'value in diversity' hypothesis (Cox & Blake, 1991). Cohen and Bailey (1997) indicate that more diverse teams, assessed based on the knowledge and skill heterogeneity, evaluate their effectiveness more positively because they benefit from multiple experiences and perspectives. Also, these teams can use member knowledge to communicate better and cooperate with external groups. To the degree to which global virtual team members can find the right mix of competences, they potentiate capabilities, benefiting from diversity, suitability to task characteristics, and access to a virtually unlimited pool of talented individuals.

Proposition 4: *In global virtual teams, the team mental model, seen as a psychological trait, is more suitable to the accomplishment of team tasks than the team mental model of face-to-face teams and increases the performance of global virtual teams.*

Social Loafing, a Manifestation of the Team Mental Model Motivational Component

Teamwork represents the activities and behaviors in which teams engage in order to complete tasks and achieve goals. When some team members are disengaged, the motivational characteristic of the team mental model is unfavorable and team's task-completion and goal-achievement may be impaired.

Since global virtual teamwork relies on the use of technology, the motivation of their members has an added layer of complexity related to the motivation with is technology (Boughzala et al., 2012). Hedonic and social factors related to the technology use in global virtual teams can have opposite effects, either accepting and stimulating or, alternatively, inhibiting and even rejecting technology. As suggested by Boughzala et al. (2012), motivation in global virtual teams is likely tangled to team members' capabilities, including computer self-efficacy, skills, knowledge, cognitions, and experiences, to effectively manage technology and incorporate it in teamwork activities.

From a theoretical standpoint, tasks of global virtual teams can be disjunctive, additive or conjunctive. In the first case, the team members who have the highest capabilities that are essential for the completion of the team task have the strongest impact on team performance. In the second case, the team performance is simply the sum of individual team members' contributions resulting from their capabilities. In the third case, the team performance depends on the abilities of the 'weakest link' that is the poorest performing team member or the team member who has the lowest level of capabilities. While most team tasks may perform additive tasks, these teams may also perform conjunctive and disjunctive tasks. The performance of teams that perform conjunctive tasks depends on the abilities of the team members who have the lowest levels of capabilities and contribution to the accomplishment of the team tasks. Likewise, the performance of teams that perform disjunctive tasks depends on the capabilities and contributions of the team members who are less skilled or committed to the team, though to a smaller degree than in the case of conjunctive tasks.

TMM reflects not only the cognitive and affective states, but also the motivational state. Since it is related to team interactions, TMM can have a positive effect on teamwork when team members are motivated and a negative impact when one or more team members are not motivated, disengaged or simply do not contribute as much as they should.

Coinciding with the increased popularity of teamwork research, more studies have been devoted to explaining why and how poor involvement or contribution of relatively few team members is translated into lower team performance and motivational losses (George, 1992). The motivational component of TMM can be apparent in different ways during teamwork, based on various mechanisms. One such potential

mechanism is based on social loafing, a phenomenon that occurs when some team members are less involved and do not contribute as much as they should, hindering the team performance. Social loafing reflects motivational characteristics of TMM, affecting especially teams who perform conjunctive and additive tasks.

The loss in team performance that occurs when team members don't work as hard as they should can follow uncertainty regarding 'who contributes what' within the team and the tendency for team members to feel less accountable for team outcomes. Reduced accountability may cause some team members to exert less effort when working on team tasks, engaging in social loafing (Latané et al., 1979; Jackson & LePine, 2003). Struggle to reduce uncertainty, as well as dissatisfaction and within-team interpersonal conflict can be reasons for social loafing. Social loafing can occur unconsciously due to the decreased social awareness in team setting and reduced accountability for team outcomes. They are triggered by uncertainty regarding contributions of each team member and lack of identification of individual contribution to the team outcomes (Early, 1989). Because social loafing usually causes team members to extend less effort, further conflict can emerge within the team, fostering unintended negative consequences of teamwork.

Investigating antecedents of social loafing, research found several factors that favor social loafing. They include team size, task interdependence, task visibility, and distributive justice (Liden et al., 2004). Of utmost importance in its assessment is the perceived social loafing, defined as the extent to which team members feel that one or more members exert less effort than they should (Comer, 1995). In the presence of perceived social loafing, other team members may be inclined to withhold their own effort or, quite contrary, devote more effort and engage less in social loafing, as suggested by social compensation hypothesis (Williams & Karau, 1991). While in the former alternative the effect of social loafing is exacerbated, in the latter alternative, the impact on team members is quite the opposite, with team members taking compensatory action and working harder for altruistic reasons or own personal gain (Jassawalla et al., 2009). However, the sustainability of this additional effort is doubtful, questioning how long will team members continue to devote more effort in order to compensate for the perceived social loafer(s).

Previous research (e.g., Ingham et al., 1974) has convincingly excluded coordination struggles within teams as the primary source of social loafing, opening the door to a motivation-based explanatory mechanism for social loafing. Liden et al. (2004) rationalized social loafing as the effect of some individual members' lack of intrinsic motivation. Coordination difficulties aside, an elaborated causal mechanism based on the job characteristic model (Hackman & Oldham, 1980) can also account for social loafing. Job characteristic model sheds light over intrinsic factors that can hinder motivation, including limited knowledge of results, diluted responsibility for outcomes, and lack of task identity and significance.

Social loafing can occur under several circumstances. Team members may engage in social loafing when they experience a sense of occupational isolation (Webster & Wing-Fai, 2017) and lack of any performance feedback from others. Team members may also engage in social loafing if they feel that their individual efforts are less impactful, due to more influential team members and exacerbated procedures or technologies. Furthermore, some team members may fail to clearly identify their individual input or outcome and, as a result, work less. Besides, one or more team members may downplay the challenge and uniqueness of their individual contributions and reduce their engagement.

Consistent with this motivation-based causal mechanism, empirical studies showed that social loafing is negatively associated with: a) peer appraisal (Druskat & Wolff, 1999); b) task visibility, that describes the degree to which others can observe and assess behaviors (Wagner, 1995); c) challenge and uniqueness of team members' individual contributions (George, 1992). Social loafing is also negatively related to intrinsic involvement (Harkins & Petty, 1982) and shared responsibility that reflects changes in feelings or personal responsibility that team members experience as a result of the presence of other members (Wagner, 1995). Research on student team projects (Aggarwal & O'Brien, 2008) suggests that the scope of the project and team size can increase the likelihood and incidence of social loafing. As mentioned before, other explanatory mechanisms of propensity for social loafing are based on low group cohesiveness (Karau & Williams, 1993), individualistic orientation (Wagner, 1995), and depersonalized 'swift' trust that may lead to lower individual commitment (Jarvenpaa & Leidner, 1998).

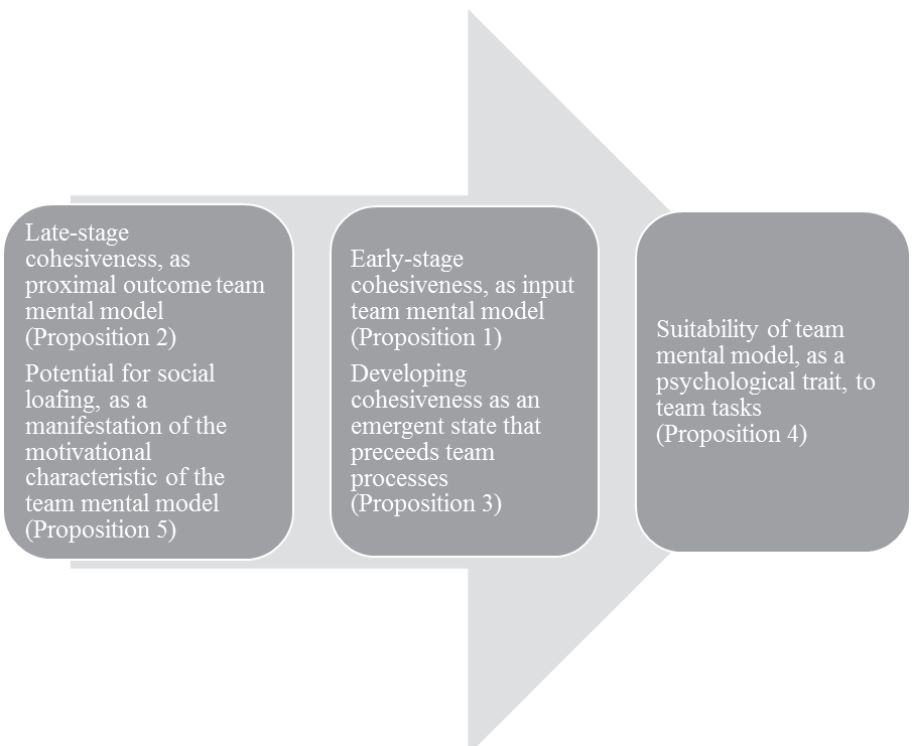
The relationship between affective and motivational characteristics of TMM - specifically, between team cohesiveness and team members' social loafing – is likely to be negative. Members of cohesive groups tend to engage in less social loafing. Expectations about other team members' behaviors may account for this tendency. Reasonable and realistic expectations in cohesive teams are likely to reduce social loafing. If held constant, this expectation will eliminate differences between individual and individual-within-team performance (Earley, 1989). By contrast, in less-cohesive teams, when team members do not know each other or are not committed to the team, social loafing can occur. This explanation is based on the assumption that social loafing is motivated by either fear, in anticipation of the social loafing of others so as to avoid to be perceived as a 'sucker' or exacerbated self-interest, when social loafer believes that actions of the other team members will be enough to accomplish team objectives.

While traditional face-to-face team research has long emphasized the importance of social loafing, research on virtual teams has been less common. There are basic similarities in the virtual and face-to-face team processes, but we assert that there are also differences in the motivational dynamics that occur between the two types of teams. Unlike face-to-face teams, global virtual teams tend to present fewer oppor-

tunities for mutual performance monitoring and back-up behavior, given the geographic dispersion of team members. Thus, task visibility and intrinsic motivation may be lower, limiting opportunities for adaptability and employment of additional resources that could compensate for inadequate contribution of team members who contribute less to the team effort. Additionally, global virtual team members tend to experience more uncertainty regarding contributions of each individual team member, take fewer responsibilities, and perceive less accountability, all of which having a negative impact on the motivational component of team mental model.

Proposition 5: Social loafing is more severe and has a stronger negative impact on performance in global virtual teams than in face-to-face teams.

Figure 2. Visual tool describing the propositions



The summary of these propositions is shown in Figure 2. The arrow points toward higher level of virtuality that is common in global virtual teams. The team characteristics from the left side are described by no virtuality (as common in face-to-face teams), while the team characteristics from the right side are described by more virtuality, as it is the case with global virtual teams. Global virtual teamwork benefits from increased suitability to team tasks and is harmed by late-stage (i.e., team out-

come) cohesiveness and potential for social loafing. Face-to-face teams are proposed to be less affected by social loafing, the motivational characteristic of team mental model.

Conclusions

Teamwork is a common characteristic of today's workplace environment. People work in teams as much as – and, at times, more than – they work individually. New technologies have continuously influenced the exchange of information, cooperation and communication, facilitating the development of global virtual teamwork. The use of technologies has significant influences on cognitive, affective, motivational and behavioral factors that underlie teamwork. There are considerable differences between the face-to-face and global virtual teamwork that have implications on team design and mental model, as well as team interventions and effectiveness.

Our analysis focuses on TMM with the objective of comparing global virtual teams and face-to-face teams and identifying advantages and limitations of global virtual teamwork. We address a less-researched area, at the confluence between virtuality and TMM. We analyzed cohesiveness, the affective characteristic of TMM, conceptualized in three different forms: an emergent state that is distinctive from team processes, an input, and a proximal outcome. We also analyzed team and task capabilities that describe TMM as a psychosocial trait, and social loafing that is a manifestation of the disengagement and describes a motivational characteristic of TMM. We selected cohesiveness, team and task capabilities and social loafing because they capture different facets of TMM, a construct conceptualized in different ways in IPO models. The different conceptualizations of the TMT concept suggests its complexity and strong relevance for understanding teamwork, as well as its importance in providing practical guidance to researchers and practitioners.

Given that team members are usually dispersed over temporal, geographic and relational boundaries, global virtual teams tend to experience motivational losses, in the form of social loafing, conceptualized as a manifestation of the motivational characteristic of TMM. Global virtual teams tend to be better equipped to perform complex tasks than face-to-face teams, as their collective competence spawns psychological traits that are, potentially, more suitable to team tasks. Meanwhile, cohesiveness, as both an input TMM and an emergent state that precedes team processes, is unlikely to have significantly different effects in face-to-face and global virtual teams. Cohesiveness, as a proximal outcome suffers in global virtual teams, in part because 'trust needs touch' (Handy, 1995, p.46) and global virtual team members tend to develop a more superficial, less personalized type of trust.

Table 1. Cognitive, motivational and affective implications of virtual team mental model

Team mental model includes mutual discovery, critical engagement, knowledge exchange, resolution. Dynamic team mental model help delineate team activities, such as interactions, participation, synthesis	
Cognitive process	
Team cognition, defined as information shared by team members about the task and performance	(-) communication-related obstacles, which can develop while using some information and communication technologies, especially in cross-cultural contexts, may inhibit coordination and interpretation (+) stronger communication-performance relationship, with increased interdependence between team members and completion of more challenging tasks (+) better synergy and innovation as a result of the diversity of members' perspectives, opportunities to combine varied resources, and autonomy (+) enhanced team cross-learning owing to members' various cultural backgrounds
Motivational characteristic	
Motivation – intrinsic motivation most and foremost – is less complex, with increased social awareness in team setting and without some hedonic and social factors related to the use of technology	(-) low task visibility may translate into lower accountability, expectancy, instrumentality and valence, and hint to less effective mutual performance monitoring, backup behavior, adaptation, and team's overall performance (-) broader scope of opportunistic behavior in high uncertainty conditions, brought up by clarity and consensus hindrances, may suppress engagement and inhibit cohesiveness
Affective state	
Helps grow team members' attachment to the team, develop emotional bonds, and foster teams' cohesiveness and commitment	(-) virtual interaction may be associated to negative affective commitment (-) lack of shared context may prevent the development of shared team identity (-) higher potential for differing beliefs, contradictory values and divergent interpretations, and fewer opportunities to address them (+) cohesiveness tends to promote higher levels of team performance through conformity to team norms, performance orientation, and enhanced coordination among diverse team members (+) cultural diversity is positively related to the satisfaction with the team that is a dimension of cohesiveness (+) swift trust development, facilitated by continuous social exchange and strengthen by action under conditions of open and thoughtful exchange of information, predictable behaviors, high-quality individual contributions, and timely and detailed accounts of work performed by each individual team member

Both the positive (+) and negative (-) cognitive, motivational and affective implications of global virtual team mental model are summarized in Table 1. Important positive implications for global virtual teams' performance include epistemic opportunities emerging from diverse capabilities, knowledge heterogeneity and within team cross-learning potential, as well as enhanced coordination and performance orientation stimulated by the use of information, communication and collaboration technologies.

Future research in global virtual teams can benefit from an expanded view of the team mental model to focus on its multi-dimensionality, including the affective, motivational and cognitive characteristics. Empirical research can develop joint analyses of the different views of the team mental model: a psychological trait capturing team and task capabilities of team members, an emergent state, an input and a proximal outcome. Advancing research on team mental model in global virtual teams may help our understanding of the impact of virtuality on teamwork. One implication may be the shifting relation between what team members already know and what they can find and share. Technological endowments that characterize global virtual teamwork may enhance the importance of finding and sharing information to the detriment of the existing knowledge and abilities of team members. Given the wealth of information available, what team members actually know tends to be regarded – improperly, at times – as less relevant than what they can find and share with team members. Both existing knowledge and capabilities, and the capacity to find new information and develop further skills are important. In addition, global virtual teams may need significant managerial involvement to emphasize common goals, facilitate team diversity, and adjust to technological challenges.

We also focused on different facets of TMM with the aim of shedding more light on global virtual teamwork and identifying similarities and differences between face-to-face and global virtual teams. Global virtual teamwork has both opportunities and hindrances. Opportunities include autonomy and innovative potential, as well as the potential for the articulation of multiple and diverse standpoints that can generate team synergies. Hindrances include lapses in clarity, consensus, commitment, and coordination. Furthermore, global virtual teamwork has specificity and uncertainty challenges that increase the scope of opportunistic behavior and can affect trust between team members. Additionally, global virtual teams can experience motivational losses, in the form of social loafing, when team members may take advantage of the task invisibility to contribute less to the team. As suggested by Jarvenpaa and Leidner (1998), the 'swift' trust that may develop in these teams encourages categorical judgments and stereotyping, and needs to be controlled through continuous facilitation, prompt response, social exchange and action. Face-to-face teams remain the most effective ways of developing trust, transferring tacit knowledge and preventing disengagement.

Global virtual teamwork can present both opportunities and hindrances for team performance, promoting performance orientation, while potentially hurting team outcomes to the degree to which individualism value orientations or anti-work norms are prevalent within the team. TMM can benefit from diverse team membership and suitability to task characteristics. The present study helps identify some of the global virtual teamwork's strengths and weaknesses, providing learning points with regard to the complex dimensionality of the team mental model.

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