



When shared cognition leads to closed minds: Temporal mental models, team learning, adaptation and performance



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ABSTRACT

In this study we examined the moderating effect of temporal mental model accuracy on the relationship between temporal mental model similarity and team learning. Further, we investigated the mediating mechanism of team adaptation in the relationship between team learning and performance. The study was conducted in a management simulation involving 68 teams (319 individuals). We collected data at three time points. The results showed that when accuracy is high, temporal mental model similarity is not significantly related to team learning; whereas, when accuracy is low, the more similar the team members' mental models are, the less they engage in learning behaviors. This suggests that sharing an inaccurate mental model leads to closed minds. In addition, we found team adaptation to mediate the relationship between team learning and performance. These findings emphasize the importance of temporal mental models in predicting team learning, and the importance of team learning for team adaptation and performance.

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1. Introduction

Increasingly scholars emphasize that in complex and demanding contexts teams need to be able to adapt quickly and appropriately to recurrent changes (Baard, Rench, & Kozlowski, 2014; Burke, Stagl, Salas, Pierce, & Kendal, 2006; Rosen et al., 2011). Teams need to adjust their cognitive and behavioral processes to allow them to evaluate and analyze situations in order to adjust to them in the best way possible (Burke et al., 2006; Randall, Resick, & DeChurch, 2011; Uitdewilligen, Waller, & Pitariu, 2013). Team learning plays a crucial role as an essential, though not sufficient, condition for team adaptation (Burke et al., 2006; Rosen et al., 2011). Team adaptation, as a process, occurs when a team recognizes that a change happens in the team environment, and is able to effectively address the unexpected situation (Baard et al., 2014; Maynard, Kennedy, & Sommer, 2015). When team members engage in team learning processes, they evaluate and reflect on past performance episodes and interpret the consequences of team

actions. Therefore, they are likely to improve their task and team processes, which enables the team to adapt to novel situations, which in turn facilitates performance – the objective criterion that indicates team level task accomplishment (Hackman, 1987; Rosen et al., 2011).

Team learning refers to a team process in which team members ask questions, seek feedback, reflect and discuss results, errors, and (un)expected outcomes (Edmondson, 1999). A shared understanding about the temporal aspects of work is crucial to promote the team learning process. As teams operate in organizational contexts that are systematically pressured by time, they are better able to engage in learning behaviors when team members share a temporal mental model – common knowledge about deadlines for task accomplishment, the pacing or speed at which activities occur, the time available for each activity, and the sequencing of tasks (Mohammed, Hamilton, Tesler, Mancuso, & McNeese, 2015; Santos, Uitdewilligen, & Passos, 2015; Standifer & Bluedorn, 2006). A temporal mental model helps teams to coordinate their activities according to the time schedule and to anticipate and understand the actions of each other based on a commonly shared blueprint of plans and schedules (Mohammed et al., 2015; Santos et al., 2015).

In this study we focus on the relevance of temporal mental

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models for team learning. We postulate that when team members share a temporal mental model they make an efficient use of the team's time, thereby creating more time for the team to engage in learning behaviors (Santos et al., 2015). The common temporal understanding ensures that team members are aligned regarding the temporal demands of the team's work, such as when deadlines have to be met and how much time is available for each activity (Cannon-Bowers, Salas, & Converse, 1993). Teams may have a *similar* temporal mental model – a mental model that is similar among team members – and an *accurate* temporal mental model – a mental model that is appropriate for the task according to experts in the respective area (Edwards, Day, Arthur, & Bell, 2006). Thus far, researchers have investigated how task and team mental model similarity and accuracy interact to predict team adaptation and performance (e.g., Burtscher, Kolbe, Wacker, & Manser, 2011; Marks, Zaccaro, & Mathieu, 2000); however, research on the interactive effects of *temporal* mental model similarity and accuracy is missing. Moreover, a relevant discussion that needs clarification is whether teams with a similar but inaccurate temporal mental model are able to learn from each other as much as teams in which team members share a similar and accurate temporal mental model. We posit that when team members have a similar but inaccurate understanding of the temporal aspects of their work, this will keep them from discussing their tasks, reflecting on the results and learning from each other.

To summarize, with this study we contribute to shared mental model literature by analyzing the temporal dimension of mental models, and analyzing the interactive effect of temporal mental model similarity and accuracy on team learning. Further, we contribute to the team learning literature by analyzing the effect of team learning on team adaptation, and on performance, as recent theoretical models have suggested (Burke et al., 2006; Rosen et al., 2011).

2. Theoretical background

2.1. Team learning and temporal mental models

In 2005, the United States faced Hurricane Katrina – one of the most deadly hurricanes in the United States' history (Moynihan, 2007). While Katrina raged through the United States, the different teams that worked to save people and to minimize the damages failed to coordinate themselves, to learn from each other, and to adapt their responses to the unexpected situation and under a lot of time pressure. Additionally, there were a number of delays in making the correct decisions, which led to dramatic consequences: aid was not delivered in time, people were not evacuated in time because of the delays in providing buses to do it, and people were left with no basic supplies (Moynihan, 2007). This example demonstrates the negative consequences that may occur when teams fail mostly because team members do not establish and maintain congruence in their temporal perceptions (Mohammed, Tesler, & Hamilton, 2012). As Moynihan (2007) mentioned, “time is an essential ingredient in learning”, and, although learning has occurred during the Hurricane, “learning did not occur rapidly enough to dramatically impact the Katrina response” (p. 18).

The example of how teams dealt with Hurricane Katrina shows the importance of congruence in team members' temporal perceptions in extreme conditions, as well as the importance of engaging in team learning behaviors. These two aspects are not only important in extreme situations like the Hurricane Katrina. Most of the teamwork environments are increasingly complex, dynamic, and adaptive, and teams are constantly pressured by time. Nowadays, people often are member of more than one team,

and team members may be geographically dispersed and often need to manage multiple projects simultaneously (Ancona & Chong, 1999; Waller, Conte, Gibson, & Carpenter, 2001). Therefore, teams often need to discuss, make decisions, and achieve their goals in a short-period of time and under high time pressure (Waller et al., 2001). Team members planning and setting deadlines is crucial to ensure that teams are able to perform their tasks under time pressure and stress, particularly when something unexpected happens. In sum, because managing time well is so crucial for team functioning, it is important that team members develop a shared and accurate cognitive structure about the temporal aspects of their work.

We analyze the effect of temporal mental model on team learning, arguing that a mental model works as a common basis that provides a fertile breeding ground for teams to engage in team learning behaviors (Santos et al., 2015; Tindale, Stawiski, & Jacobs, 2008), which is related to the resource allocation perspective on team functioning (Barnes et al., 2008; Kanfer & Ackerman, 1989). Team learning “is a resource-intensive process that detracts from core task performance and that consumes time and cognitive resources” (Santos et al., 2015, p. 719). Therefore, teams in which members have a similar and accurate temporal mental model are more likely to naturally engage in team learning behaviors without requiring any substantial extra effort in the process. When team members have a common understanding about the temporal aspects of the work, they are able to communicate ideas and coordinate themselves. Thus, team members are able to engage in team learning behaviors using few temporal and cognitive resources (Bunderson & Sutcliffe, 2003).

A temporal mental model helps teams to coordinate their actions and perform the tasks on time, and is particularly important when team members are highly interdependent, and need to collaborate and share information continuously (Mohammed et al., 2015). Further, a temporal mental model allows team members to anticipate and understand how the actions of the other team members fit within the plans and schedules, and to know in advance what other team members need to finish a task on time (Gevers, Rutte, & van Eerde, 2006; Standifer & Bluedorn, 2006). A similar temporal mental model helps team members to synchronize their actions with the actions of other members; while an accurate temporal mental model helps to fit the team's actions with the external temporal demands (Gevers et al., 2006; Mohammed et al., 2012, 2015).

A number of studies have integrated the notion of time in team cognition and team processes research (e.g., Gevers et al., 2006; Standifer et al., 2015). Moreover, several authors argued that shared mental models should cover not only task and team contents but also the temporal aspects of work (Guiette & Vandenbempt, 2013; Mohammed et al., 2012; Standifer & Bluedorn, 2006). However, to date there are only two studies (Mohammed et al., 2015; Santos et al., 2015) measuring temporal mental models. Mohammed and colleagues' study (2015) operationalized the notion of temporal mental model assessing its discriminant validity relative to team and task mental model constructs in predicting team performance. The results showed that temporal mental model positively predicted team performance beyond task and team mental models. The results also showed that temporal mental model positively influenced team performance early on and later on in the teams' lifecycle. Santos and colleagues' study (2015) investigated whether team learning processes lead to performance improvement, and whether this relationship is moderated by the similarity of shared mental models. The authors looked at the effects of task, team, and temporal mental models. Their results showed that when task and temporal mental model similarity were high, team learning processes were positively

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