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The effects of virtualness on teamwork behavioral components: The role of shared mental models

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ABSTRACT

Virtual teams are an essential part of work organizations. They help organizations utilize skills and expertise regardless of where they are located. The virtual team literature suggests that these teams often experience process losses compared to their face-to-face counterparts. In this paper we propose that as virtualness increases, a team's shared mental models become more complex; this limits the effectiveness of particular teamwork behaviors: mutual performance monitoring, backup behavior and adaptation. We identify specific factors that are reflected in increased mental model complexity of virtual teams. Further we examine the moderating role that the accuracy and similarity of these shared mental models as well as the level of virtualness has on the relation between complexity and teamwork behaviors. Finally, we examine the effects of training inventions on mental model accuracy. To this end, we review the existing literature to develop a model and specific propositions.

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1. Introduction

Organizations have considered teams a vital component to achieve organizational objectives since the late 1980s (Kang, Yang, & Rowley, 2006). During the past 20 years, however, technological advances have led to new forms of work teams such as virtual teams (VT). Virtual teams are teams in which a significant amount of interaction among geographically disbursed members occurs via electronic media rather than face-to-face interactions (Jarvenpaa & Leidner, 1999; Maznevski & Chudoba, 2000). Gibson and Cohen (2003) define virtual teams as entities that coordinate their activities primarily through some form of technology (either communication or information technology) such as e-mail, texts, or private discussion boards. Virtual teams are important because these interactions allow organizations to overcome time and distance constraints that previously limited the use of teams, reducing costs by minimizing unnecessary travel and relocation expenses (Boudreau, Loch, Robey, & Straub, 1998; Cascio, 2001). They also allow human resource professionals to effectively utilize employees' talents by selecting the best individuals to participate in teams regardless of their location, eliminating redundancy of employee tasks and increasing efficiency (Jarvenpaa & Leidner, 1999; Kirkman, Rosen, Tesluk, & Gibson, 2004; Martins, Gilson, & Maynard, 2004).

While there are clearly differences in the dynamics that occur within face-to-face teams and virtual teams, we contend that there are basic similarities in the processes, and consequently, the emergent states that are central to the functioning of both types of groups (e.g., sharing of information, generation of ideas, and evaluation of alternatives). Traditional face-to-face group research has long emphasized the importance of group process on team performance and outcomes such as member satisfaction

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(McGrath, 1984). Although there is some debate over what the specific model (e.g., input-process-output vs. input-mediator-output-input) looks like, there are influences such as process factors, mediators, and emergent states that affect group functioning and outcomes (Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Marks, Mathieu, and Zaccaro (2001) importantly differentiated team "processes," such as teamwork, from other qualities or "properties of the team that are typically dynamic in nature and vary," termed "emergent states" (p. 357). They emphasize that these emergent states reflect the cognitive, affective and motivational states in teams. Further, they suggest that these states can be considered both "inputs and proximal outcomes" (p. 358). Thus, we propose that as teams (including virtual teams) interact they form shared mental models (i.e., emergent state), which, in turn, influence teamwork (i.e., processes). We believe that understanding the relation between virtualness and team mental models is a critical issue that will affect teamwork behaviors and processes within virtual teams. Improving teamwork in increasingly virtual environments will ultimately help to improve team effectiveness.

Marks et al. (2001) define teamwork as, "… interdependent team activities that orchestrate taskwork in employees' pursuit of goals," (p. 358). And yet, "teamwork" is a ubiquitous concept that has been used in the literature to describe a wide variety of processes in which teams engage to convert inputs to outcomes. There is a lack of consistency in terms of what types of activities encompass teamwork (e.g., interpersonal skills vs. strategy and planning) and which do not. In an attempt to resolve this, Salas, Sims, and Burke (2005) reviewed 20 years of team literature to develop a theoretical concept of teamwork and identified five components that appear to be common among various definitions of teamwork: mutual performance monitoring, backup behavior, adaptability, leadership and team orientation. One component of their framework is the concept of shared mental models, which directly influence the first three teamwork components.

As groups become more virtual, their communication dynamics and shared mental models are altered. The quality of team members' communication will be affected by the nature of the media the team utilizes. It is also likely that teams operating in a virtual environment will have cognitive structures that are different in content from those of face-to-face teams as the virtual aspect may add complexity to the task and certainly to the way in which the team interacts. Klimoski and Mohammed (1994) defined team mental models as a team's shared mental model regarding the significant components of the team's situation including but not limited to its goals, tasks, tools, environment and working relationships. As suggested earlier, these mental models are an emergent state, a consequence of team interaction. To date, there has been almost no empirical research on team or shared mental models in the virtual environment. Consequently, researchers suggest that there is still much for us to understand in terms of how these cognitive structures affect team performance (Fiore, Salas, Cuevas, & Bowers, 2003; Fu, Chui, & Helander, 2006; Maynard & Gilson, 2014; Millward, Banks, & Riga, 2010; Salas, Cooke, & Rosen, 2008). This literature suggests that mental models have a positive effect on teamwork, but the mechanism by which this occurs in not well understood. Further, interacting virtually may require teams to develop new types of mental models relating the communication tools utilized, their capacities and the appropriateness of their use for certain interactions.

One mechanism by which these team mental models can shape and develop is training. Research suggests that training can improve the accuracy and similarity of teams shared mental models (Cannon-Bowers, 2007; Fiore, Hoffman, & Salas, 2008; Marks, Sabella, Burke, & Zaccaro, 2002; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Mohammed & Dumville, 2001; Smith-Jentsch, Campbell, Milanovich, & Reynolds, 2001; Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008; Stout, Cannon-Bowers, Salas, & Milanovich, 1999). Gilson, Maynard, Young, Vartiainen, and Hakonen's (2015) review of the virtual teams literature during the past decade identified several studies (Holtbrügge, Schillo, Rogers, & Friedmann, 2011; Rosen, Furst, & Blackburn, 2006; Kanawattanachai & Yoo, 2007) that indicated training can improve the effectiveness and success of virtual teams. They identified several types of training such as technology, cultural and communication that help virtual teams perform better. They did not discuss why these particular forms training improved performance. We believe that the concept of team mental models may help us explain these effects. As the level of teams' virtualness increases, the complexities of coordinating their activities can increase exponentially, resulting in greater difficulty to develop a shared understanding of how to accomplish their tasks, which, in turn, may diminish teamwork effectiveness. A clearer understanding of how increases in virtualness affect the complexity of teams' circumstances and subsequently, their mental models, may enhance our knowledge of virtual team effectiveness and the role that training can play in its improvement. Further, it may help to identify the types of training or skills needed for teams to operate under increasing levels of virtualness that will maximize the potential for virtual team success.

The purpose of this paper is to present the ways in which shared mental models affect the behavioral components of teamwork within virtual teams. The concept of shared mental models (the team's cognitive structures of their task, team, interactions and environment) has been extensively examined in the face-to-face team literature (Klimoski & Mohammed, 1994; Mohammed, Ferzandi, & Hamilton, 2010). DeChurch and Mesmer-Magnus (2010) performed a meta-analysis of team shared cognition, including team mental models, and found a significant positive relation between the quality of teams' cognitive structures (e.g., mental models) and team performance. However, shared mental models have only recently begun to receive attention in the virtual team literature (Curşeu, 2006; Maynard & Gilson, 2014; Mortensen, 2014). Although other integrations of virtual team dynamics have been recently developed (Caya, Mortensen, & Pinsonneault, 2013; Maynard & Gilson, 2014), these have been aimed more toward developing theoretical perspectives of virtual team dynamics rather than toward practical application. We examine shared mental models and discuss how they affect virtual team ability to engage in effective teamwork. We believe that our approach can aid both academics and managers.

This paper also contributes to the expanding virtual team literature by integrating the dimensions of virtualness with the mental model construct and identifying the complexity this adds to a team's shared understanding of its situation. Specifically, we contend that as teams become more virtual the complexity of their situation changes which affects the nature of their mental models. Further, the accuracy and similarity of team mental models will affect team processes such as the behavioral components

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