Chapter 9
Shared Mental Model Development During Technology–Mediated Collaboration

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ABSTRACT

This study examines how collaboration mode—face-to-face and videoconferencing technology-mediated virtual teams—shapes negotiated shared interpretation of ideas needed for shared mental model construction. Social impact theory and group action theory provide a framework for explaining how technology-mediated collaboration constrains or enhances team shared mental model development. Social impact theory suggests that team member behavior is affected by 1) influential members, 2) number of members, and 3) proximity. Group action theory proposes that team member behavior is guided by 1) assessment of task requirements, 2) adopted task strategy, and 3) evaluation of task solution. This study argues that technology-mediated collaboration will exhibit lower participation rates and intra-team communication deficiencies while developing a shared mental model of task requirements, strategy and status. Partial least squares analysis revealed that technology-mediated collaboration does impact shared mental model development. Observers noted that decision making effectiveness and timeliness regarding task execution strategy and solution content was facilitated by a shared understanding of the task context. The study also confirmed the utility of direct observation for studying communication behaviors and social interaction in the development of shared mental model and teamwork.

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Organizations are under constant pressure to leverage expertise both locally and distributed throughout multiple sites (Elsbach & Hargadon, 2006; Williams & Rains, 2007). Consequently, companies are increasingly turning to a new business model where virtual teams are constructed with individuals that 1) are geographical dispersed, 2) are linked via collaboration technologies, and 3) collaborate across time and space (Garton & Wegryn, 2006). In recent virtual team studies, the collaboration technology used to link virtual team members was found to determine the temporal aspect (e.g., asynchronous versus synchronous) of collaboration (DeLuca & Valacich, 2006; Rutkowski, Saunders, & Vogel, 2007), the extent to which team member presence is perceived (Chidambaram & Tung, 2005; Fiol & O’Connor, 2005) and effectiveness of information exchange (Barkhi, Amiri, & James, 2006).

A number of studies have also investigated the impact of team member remote distribution on social factors present in virtual team settings such as cultural diversity (Fuller & Davison, 2007; Lim & Zhong, 2006), conflict and cooperation (Hinds & Mortensen, 2005; Kankanhalli, Tan, & Wei, 2007), trust (Boyle, Kacmar, & George, 2008; Thomas & Bostrom, 2008) and leadership (Glückler & Schrott, 2007; Zhang et al., 2009).

A literature review reveals that a gap in technology-mediated collaboration research lies in the limited studies that have investigated the dynamic and emergent nature of higher order information processing such as team shared mental model development (Hasty, Massey, & Brown, 2006; Kanawattanachal & Yoo, 2007; Majchrzak, Beath, Lim, & Chin, 2005). In this study, a qualitative analysis of group behavior during sense-making of information exchanged and interactions (i.e., direct observation of perceptions, actions, comments, behaviors of team members) is used to assess their impact on team functioning, productivity and satisfaction. From a theoretical standpoint, such research is necessary promote further construct validity needed to make correct inferences from empirical tests of theoretically derived relationships (Edwards, 2001; MacKenzie, Podsakoff, & Jarvis, 2005). From a practical standpoint, such research is needed for the reason that empirical identification of significant team cognition process behaviors offer more points of leverage for designing prescriptive practices aimed at improving team-based problem solving.

In this study, the following research questions are addressed:

1. What observable behaviors are indicative of shared mental model construction?
2. How does technology-mediated collaboration impact shared mental model construction?
3. How does shared mental model facilitate the quality of team action and ultimately task outcomes?

In what follows, the next section reviews the relevant literature on the role of shared knowledge of task content and task situation awareness on regulating the quality of group action during problem solving. This is followed by the presentation of the research model and hypotheses. The next two sections describe the research methodology and results, respectively. Finally, discussion of the findings, contributions, implications, limitations and suggestions for future research is presented.

LITERATURE REVIEW

Team Cognition and Shared Mental Model

Team cognition refers to the ways in which a team process and use information (He, Butler, & King,