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A meta-analytic investigation of virtuality and information sharing in teams

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ABSTRACT

We uncover new insights on the role of virtuality on team information sharing. A new two-dimensional conceptualization of information sharing (Mesmer-Magnus & DeChurch, 2009) enabled us to reconcile past inconsistencies in the virtual team literature. Recasting the findings of 94 studies (total number of groups = 5596; total *N* approximately = 19,702) into this framework reveals three key insights. First, virtuality improves the sharing of unique information, but hinders the openness of information sharing. Second, unique information sharing is more important to the performance of face-to-face teams than is open information sharing, whereas open information sharing is more important to the performance of virtual teams than is unique information sharing. Third, the effects of virtuality on information sharing are more curvilinear than linear – such that low levels of virtuality improve information sharing, but high levels hider it. Implications for research and practice are discussed.

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Introduction

Organizations are increasingly structuring work around teams due to their potential to excel in complex decision-making and problem-solving tasks. Two important aspects of teamwork are the knowledge-intensity of their tasks and the virtual arrangement of their members. Across the vast array of organizational teams, those designing products, developing software, treating patients, researching new drug treatments, and inventing solutions to mass oil spills, teams today are utilizing information distributed across multiple team members, and they are doing so with the aid of an ever-increasing variety of information technology. Virtual teams are comprised of "geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task (Townsend, DeMarie, & Hendrickson, 1998, p. 17)." According to Lipsinger (2010), at least half of teams in today's organizations operate as virtual teams on a regular basis. In fact, even a decade ago, surveys revealed that 61% of employees in organizations with 500 or more employees worked as part of virtual project teams; nearly half of those surveyed indicated they completed virtual work at least once per week (Modalis Research Technologies, 2001).

This modern reality of teamwork creates a real need to understand the fundamental ways in which communicating through technology impacts (1) how much and what types of information are exchanged in teams, and (2) the value of the information exchanged to team performance. Though organizational scientists have been investigating the impact of virtual communication on team information sharing for nearly two decades (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Fjermestad, 2004; McLeod, 1992; Rains, 2005), theoretical shortcomings in defining virtuality and information sharing have impeded progress in this area (cf. Kirkman & Mathieu, 2005; Mesmer-Magnus & DeChurch, 2009). Towards this aim, we employ meta-analysis to uncover core relationships between team virtuality and information sharing.

Past findings and meta-analyses on the impact of virtual communication in teams have yielded no clear pattern of results. Depending on the source, we can either conclude that virtual communication is a benefit (Rains, 2005) or a detriment (Fjermestad, 2004) to team information sharing. A recent discovery in re-conceptualizing team information sharing may hold the key to resolving this apparent discrepancy. Mesmer-Magnus and DeChurch (2009) meta-analyzed the team information sharing literature and found essentially two different forms of information sharing, uniqueness and openness, that have different effects on team outcomes. Building on this distinction, perhaps we can better understand the impact of virtual communication in teams by adopting this multidimensional view. Furthermore, we adopt Kirkman and Mathieu's (2005) expanded definition of virtuality that captures the extent to which team interactions resemble those that would occur if mediating technologies were not employed (i.e., a combination of amount of tool use, informational value of tools, and synchronicity of tools

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which may yield varying degrees of similarity/dissimilarity with face-to-face interactions). We utilize these expanded views of virtuality and information sharing to address two critical questions. First, to what extent does virtuality affect information sharing uniqueness and openness in teams? Second, do the effects of information sharing uniqueness and openness on team performance depend on the means through which information is transmitted?

Theoretical development

A number of reviews have examined the role of communication modalities on team communication, particularly informational processes (e.g., Baltes et al., 2002; Fjermestad, 2004; McLeod, 1992; Rains, 2005). These reviews link team communication mode (i.e., group support systems versus face-to-face) to a range of information-relevant outcomes including degree of task focus, decision quality, equality of participation, communication effectiveness, production of unique ideas, member dominance, member satisfaction, influence equality, normative influence, and decision shifts. However, these reviews have yielded mixed findings regarding how communication mode affects information sharing and other related outcomes in teams. Fjermestad (2004) found face-to-face teams reported better communication than Group Support System (GSS) teams, whereas Rains (2005) found the opposite, that groups using a GSS generated a larger amount of unique ideas than face-to-face groups. Baltes and colleagues (2002) meta-analytically concluded that computer-mediated teams were less effective decision-makers than face-to-face teams, while McLeod (1992) found the opposite, observing positive outcomes for groups using GSS, including improved decision quality and equality of participation.

Beyond the contradictory findings of past reviews, we submit that two important theoretical and practical extensions necessitate a new review to uncover these relationships. First, past reviews have compared the amount of information sharing in face-to-face and virtual teams, making no distinction in the degree of virtuality of these teams. The current meta-analysis moves toward a more theoretically-grounded approach to the study of virtuality by incorporating Kirkman and Mathieu's (2005) three-dimensional conceptualization of virtuality to examine key relationships along a continuum of virtuality. Second, a recent meta-analysis on team information sharing finds different predictors and outcomes of two dimensions of team information sharing: openness and uniqueness (Mesmer-Magnus & DeChurch, 2009). Our meta-analysis moves the study of virtuality forward by examining these dimensions of information sharing separately.

Dimensions of virtuality

Various definitions of team virtuality exist in the extant literature, ranging from focusing on the extent to which teams are geographically distributed (e.g., Cohen & Gibson, 2003) to defining the extent to which teams make use of virtual media (e.g., Griffith, Sawyer, & Neale, 2003). Importantly, these definitions do not give a complete picture of how 'virtual' a team is, because they focus on only one aspect of virtuality (Bell & Kozlowski, 2002; Martins, Gilson, & Maynard, 2004). For example, although teams may make use of virtual tools to communicate, various aspects of the media they use may result in communication patterns that are not markedly different from traditional teams (i.e., those that meet face-to-face). Kirkman and Mathieu (2005) recently delineated three dimensions that comprise team virtuality; the combination of these dimensions defines a team's overall level of virtuality: (1) extent of reliance on virtual tools as well as the (2) informational value and (3) synchronicity afforded by the tools. The *most virtual* teams are highly reliant on tools which are both asynchronous and result in the transmission of information with low informational value. However, teams which make use of tools that more closely mimic face-to-face interactions (e.g., videoconferencing, which is both synchronous and high in informational value) are comparatively much less virtual. As such, there is an important distinction between teams which are fully virtual (making full use of virtual tools) and those that are highly virtual (making use of tools which do not result in similar communication patterns and advantages as found in face-to-face teams; i.e., high virtuality teams).

Drawing on Kirkman and Mathieu's (2005) taxonomy, we classify teams in terms of their levels of virtuality using a combination of these three important aspects of virtuality. The first dimension is the *use of virtual tools,* which describes the proportion of team interaction that occurs via virtual means. On one end of this continuum, teams make use of no virtual media, instead interacting exclusively face-to-face. On the other end of the continuum, teams interact solely through virtual means. The second dimension of team virtuality, *informational value*, refers to the extent to which virtual tools transmit data that is valuable for team effectiveness. Kirkman and Mathieu (2005) argue that when technologies convey rich, valuable information necessary for team performance, then the exchanges are less virtual; as the richness of information decreases, the level of virtuality increases. Finally, *synchronicity* is the extent to which team interactions occur in real time versus incurring a time lag. The closer to 'real time' the team's interactions, the more synchronous (and the less virtual) the team. Phone conferences and video conferences, for example, would both be highly synchronous virtual tools, whereas email and group blogs are more asynchronous given the time lag which typically occurs between communication attempts.

Information sharing and virtuality

Information sharing is the primary process through which teams utilize their available informational resources (e.g., Bunderson & Sutcliffe, 2002; Jehn & Shah, 1997). If information is not effectively shared among team members, the team is not able to fully capitalize on the informational resources initially distributed throughout their team. However, there is more to information sharing than the quantity or frequency of the shared information. Stasser and Titus's (1985, 1987) biased information sampling model illustrates that, in general, groups spend more time discussing shared (commonly held) information that is already known by all group members than unshared information that is unique to individual team members. This is problematic given that Mesmer-Magnus and DeChurch (2009) recently meta-analytically demonstrated that information sharing enhances team performance most when teams shared unique, rather than commonly held, information. As such, the distinction between common and unique information sharing is critical when examining information sharing and its predictive effects.

The majority of existing empirical studies have examined what Mesmer-Magnus and DeChurch (2009) refer to as the uniqueness dimension of information sharing; or "variability in how many group members have access to a piece of information" (Hinsz, Tindale, & Vollrath, 1997, p. 54). These studies examine the extent to which teams are taking advantage of members' unique knowledge sets for the teams' benefit. A second subset of team information sharing studies has examined aspects of information exchange more broadly, including the volume of information shared independent of the initial distribution pattern of information among team members (Henry, 1995; Jehn & Shah, 1997). Mesmer-Magnus and DeChurch refer to these studies as investigations of the openness of information sharing. Simply stated,

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