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Virtual teams in organizations

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ABSTRACT

Organizations continue to widely adopt virtual teams as a primary way to structure work and the recent growth in utilization has outstripped theory and research on virtual teams. The explosive growth in virtual team use by organizations and the inherent challenges of virtual teams highlight the need for theory and research to inform organizations in designing, structuring and managing virtual teams. Therefore, the purpose of this special issue is to (a) advance theory and research on virtual teams, (b) offer new directions for research on the topic, and (c) contribute to efforts to enhance the effectiveness of virtual teams in organizations. Toward this end, in this introduction we provide a brief overview of virtual teams and present an input-process-output framework to contextualize and organize the eight papers appearing in this special issue.

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Virtual teams are work arrangements where team members are geographically dispersed, have limited face-to-face contact, and work interdependently through the use of electronic communication media to achieve common goals. Virtual teams connect knowledge workers together over time and distance to combine effort and achieve common goals (Bell & Kozlowski, 2002). Over the past several decades, there has been an explosive growth in organizations' use of virtual teams to organize work and this trend is expected to only continue in the future.

For example, a recent survey of 1372 business respondents from 80 countries found that 85% of the respondents worked on virtual teams and 48% reported that over half their virtual team members were members of other cultures (RW³ CultureWizard, 2016). The growth is attributable to factors including globalization, distributed expertise, organizations' need for rapid product development and innovation, and improved networking and collaboration technologies that support e-collaboration (Ilgen, Hollenbeck, Johnson, & Jandt, 2005; Kozlowski & Bell, 2003; Mathieu, Maynard, Rapp, & Gilson, 2008).

The use of virtual team structures holds great promise as virtual teams can do things collectively that collocated teams cannot. Some advantages of virtual teams include: the ability to assemble teams that maximize functional expertise by including professionals who are geographically dispersed, enabling continuous 24/7 productivity by using different time zones to their advantage, lowering costs by reducing travel, relocation and overhead, and sharing knowledge across geographic boundaries and organizational units and sites. In spite of the advantages of virtual teams, research has demonstrated that virtual teams present a number of challenges compared to co-located teams. Some disadvantages include communication and collaboration difficulties, low levels of media richness compared to co-located teams, potentially lower team engagement by team members, difficulties in creating trust and shared responsibility among team members, isolation, high levels of social distance between members, and challenges in monitoring and managing virtual teams.

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Not surprisingly, virtual teams have attracted increasing interest among researchers and practitioners due to their increase ubiquity in organizations (e.g., Gibson & Gibbs, 2006; Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015; Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002). A review of the virtual team literature reveals that most scholars agree that managing virtual teams is more difficult than managing collocated teams (Davis & Bryant, 2003; Hoch & Kozlowski, 2014). As a result of lower levels of co-presence, leaders often have less influence and less information about the team's status, progress toward milestones and functioning and therefore the leaders' management of team processes and team dynamics may be impaired (Zaccaro & Bader, 2003; Ziguers, 2003). Related is the difficulty of developing adequate practices to uncover and resolve conflicts across distance, motivate team members, monitor members' performance, and build trust and team cohesion. Consequently, challenges of managing virtual teams have received significant attention in academic literature (e.g., Bell & Kozlowski, 2002; Cascio & Shurygailo, 2003; Gilson et al., 2010; Martins, Gilson, & Maynard, 2004) as well as in practitioner publications. In spite of growing attention and interest in virtual teams, surprisingly little is still known regarding the successful management of virtual teams.

The purpose of this special issue is to contribute to the literature base on virtual teams. Specifically, our objectives include advancing theory and research on virtual teams and offering new directions for research on the topic, with the goal of contributing to efforts to inform organizations on enhancing the effectiveness of virtual teams. Toward fulfilling these objectives, we present eight articles in this special issue. To organize literature on virtual teams and the papers in this special issue, we first present an adaptation of the input-process-output model (IPO) (Hackman & Morris, 1975; McGrath, 1964), and its subsequent enhancements that incorporate iterative feedback loops (Ilgen et al., 2005). The IPO has been the dominant theoretical framework used in research on co-located teams and it provides a tool for categorizing and integrating literature on virtual teams (Hoch & Kozlowski, 2014).

1. Input-process-outcome framework

The IPO provides a useful theoretical framework for identifying key inputs, team emergent states, processes, moderators, and outcomes relevant to virtual team effectiveness. The IPO represents an approach for decomposing virtual teams in terms of deterministic categories or factors. The IPO framework assumes that input factors influence team emergent states and process factors, and that emergent states and processes impact team outcomes and mediate the relationship between input factors and team outcomes (Ilgen et al., 2005). The IPO was initially developed and applied to research on co-located or face-to-face teams; more recently researchers have applied the IPO to study virtual teams (e.g., Hoch & Kozlowski, 2014; Webster & Staples, 2006).

In the following, we first present an adaptation of the IPO framework that includes general categories that are relevant to virtual teams. The model provides a contingency approach to virtual team research, based on the assumption that in particular organizations or situations different types of virtual teams (e.g., project or functional, short term or long term) that vary in terms of virtuality may be used. As a result particular inputs, processes, and moderating factors may be more or less deterministic to their effectiveness. In addition, the IPO framework presented below provides a diagnosis tool that practitioners may use to assess virtual teams in organizations, since the model decomposes virtual teams in terms of primary factors. Consequently, the IPO provides a basic framework and tool that both researchers and practitioners can use to identify and to enhance factors that are critical to virtual team effectiveness and thus their success. Following our presentation of the IPO model, we provide an overview of the papers in this special issue and highlight their foci in terms of the IPO model.

1.1. Inputs

Fig. 1 presents an adaptation of the IPO to virtual teams. There are three input categories which represent key deterministic criteria for virtual teams. First there is the category of organizational level factors. This component includes variables representing organizational actions in the design (i.e., creating, sizing, and structuring) of virtual teams, the assignment of purpose, tasks and objectives, and factors such as the physical work environments that virtual team members operate. In addition, organizational level factors include structural supports, which are organizational mechanisms that compensate for the absence of leader co-location by structuring, supporting, and directing VTs such as information and reward systems (Bell & Kozlowski, 2002; Hoch & Kozlowski, 2014).

The second input category is team leadership factors (Kozlowski & Bell, 2003; Zaccaro, Rittman, & Marks, 2001). While initially it was assumed that competencies and behaviors needed by vertical leaders to manage virtual teams were the same as needed to lead co-located teams (Meyer, 2010), today it is widely recognized that virtual team leaders also need relevant virtual team skills and appropriate leader behaviors to deal with the lack of face-to-face contact with team members. These include leaders having additional communication skills, depth of understanding in collaborative technology, ability to influence and facilitate team member engagement, an appreciation for cultural diversity, and an ability to influence and build trust and relationships with their geographical dispersed team members. An effect of virtual communication (in contrast to face-to-face) is an attenuation of leader influence, due to lower media richness (Daft & Lengel, 1986) resulting from the absence of nonverbal and verbal cues, body language, inflection, and gestures.

Included in Fig. 1 are leader behaviors that may at least partially compensate for an attenuation of leader influence, resulting from virtuality, including transformational leadership behaviors, which are characterized by idealized influence, inspirational leadership, intellectual stimulation, and individualized consideration (Bass, 1985; Avolio, Waldman, & Yammarino, 1991). Other leadership behaviors included are relationally oriented behaviors such as LMX as well leadership behaviors that facilitate virtual team member involvement such as empowerment and participative management.

Next, as displayed in the model in Fig. 1, the third category of input factors is team composition, representing both surface level and deep level diversity and individual differences, which are expected to impact team processes and outcomes (Hoch & Dulebohn, 2013).

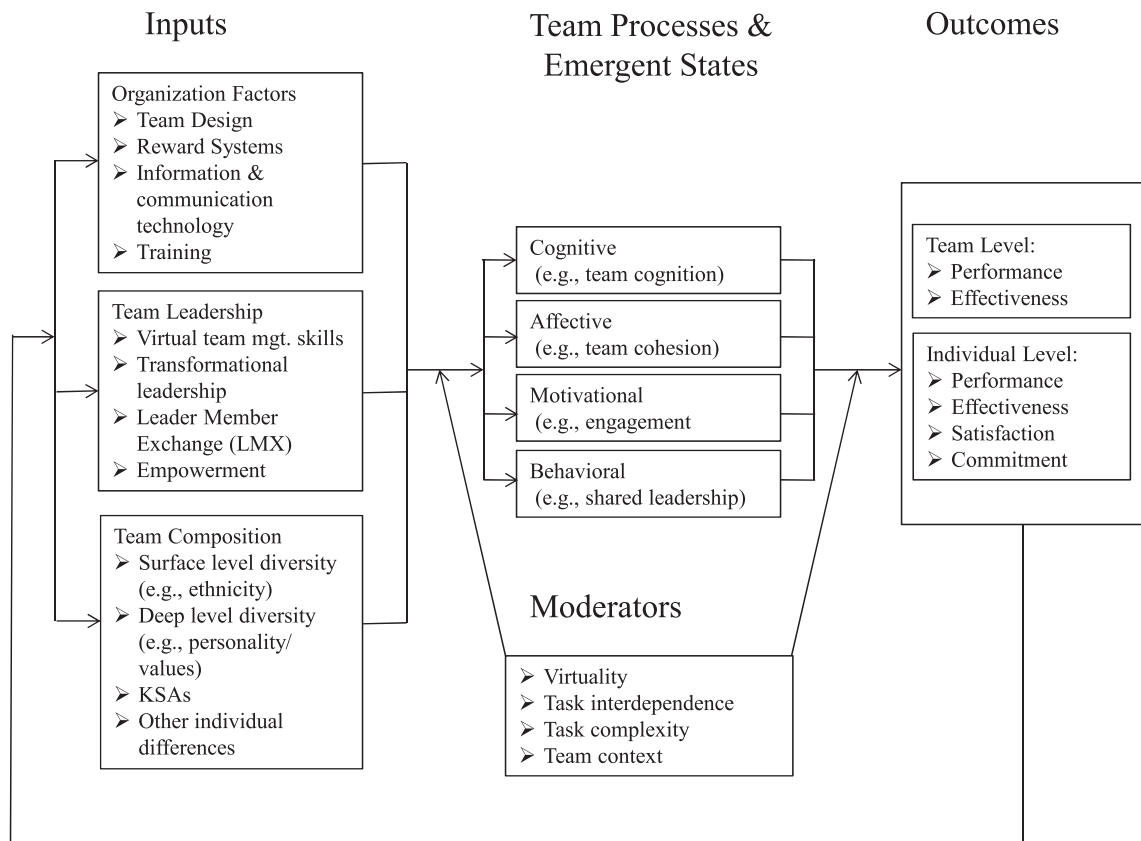


Fig. 1. Input-process-output model of virtual teams.

The team composition category includes important predictors of virtual team processes and effectiveness. The criticality of team composition was noted by Ferrazzi (2014, p. 120): “team composition should be your starting point. You won’t get anywhere without hiring (or developing) people suited to virtual team work ...” Team composition, in terms of each variable or predictor included (e.g., personality, cultural intelligences, cultural values), may be aggregated by using common indices such as the mean, or the variance, or heterogeneity of the team members’ scores (Driskell & Salas, 2013).

Team member composition factors include surface level diversity of team members, such as ethnicity, culture, language, as well as deep level diversity including personality and values. Next are team member knowledge, skills, and abilities (KSAs). Knowledge refers to members’ theoretical or practical understanding of factual and procedural information in their particular field. Skills are proficiencies developed through experience or training and include competencies such as communication skills, self-management skills, and cultural intelligence. Abilities represent the qualities of being able to perform an observable activity (such as the ability to communicate or work independently). Personality traits include characteristic patterns of thoughts, feelings, and behaviors related to functioning as a virtual team member. Finally, values represent guiding principles such as appreciation of diversity, cultural orientation (e.g., individualism-collectivism), and other values deemed important by the organization that virtual team members should share.

1.2. Team processes and emergent states

Next, team processes factors and emergent states are mediators of the inputs and outcomes relationship. Team processes refer to the interdependent acts of team members that transform inputs to outcomes. In contrast, emergent states represent process-oriented states “that characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes” (Marks, Mathieu, & Zaccaro, 2001, p. 357). Team emergent states rise out of dynamic team process interaction. Marks et al. (2001) distinguished between behavioral processes and process-oriented states, which emerge over time and are accessed via team member perceptions. We recognize the differences and position both together in the IPO model presented in Fig. 1. Emergent states and processes include cognitive processes (such as team cognition and cognitive climate), motivational processes (such as teamwork engagement), affective processes (such as team cohesion) and behavioral processes (such as shared leadership, communication, and technology usage) (Kozłowski & Bell, 2003; Mathieu et al., 2008; Zaccaro et al., 2001).

1.3. Moderators

Next, the IPO presented in Fig. 1 includes moderators. These include factors that may moderate the input and team process pathway as well as the team process and outcomes pathway by affecting the direction and/or strength of the relationships in the model. While the key moderator in the framework is virtuality, we also include interdependence and task complexity, which have traditionally been found to impact input-process and process-outcome relationships (Bell & Kozlowski, 2002; Bowers, Pharmer, & Salas, 2000; Chen, Casper, & Cortina, 2001; Hambrick, Humphrey, & Gupta, 2015). In addition, we include team context as a potential moderator. Team context includes the larger external environments in which virtual team members operate, such as the legal environment discussed in this special issue by Mark Roehling.

Although there has been some ambiguity as to what constitutes virtuality, scholars have most commonly viewed geographic dispersion and electronic media use as the distinguishing characteristics (Gibson & Gibbs, 2006; Hinds, Liu, & Lyon, 2011; O'Leary & Cummings, 2007). Combining these elements, scholars have described virtual teams as teams whose members rely on technology-mediated communication to interact with one another across multiple boundaries, such as geographic, temporal, and organizational boundaries to work on interdependent tasks (Bell & Kozlowski, 2002; Gibson & Cohen, 2003). Because co-located team members may also use technology-mediated communication, the central distinguishing factor is geographic dispersion as a boundary that is distinct to virtual teams. More recently scholars and researchers have moved beyond a dichotomous view of geographic dispersion to one that views dispersion in terms of degree (Bell & Kozlowski, 2002; de Guinea, Webster, & Staples, 2012). Further researchers have further advanced the concept by describing geographic dispersion in terms of multiple dimensions: spatial (i.e., geographic) distance, temporal (time difference), and configurational (sites, isolation and imbalance) (O'Leary & Cummings, 2007) and possibly national differences (Gibson & Gibbs, 2006; Hinds et al., 2011; Hoch & Kozlowski, 2014). Consequently, while Fig. 1 presents the label of virtuality, the factor represents a multi-dimensional concept and phenomenon.

2. Outputs

Finally, Fig. 1 presents outcomes as the final component in the IPO model. Outputs represent the effect of the processes transforming team inputs into outcomes that are valued by the organization. Virtual teams generally exist to reach certain goals, deliverables, performance outcomes, etc. We have designated two levels of outcomes. First there are team level outcomes that represent the degree to which the team achieves performance goals and objectives, represented by indicators such as team performance and effectiveness. Second, there are individual team member outcomes that reflect member performance, effectiveness, and attitudes such as satisfaction and commitment.

Finally, we include a feedback loop following Ilgen et al. (2005)'s input-mediator-output-input (IMOI) model, which accounts for the reality that teams are complex and adaptive systems and there is not necessarily a single-cycle progression from inputs through outcomes. Ilgen et al. (2005, p. 520) wrote: "Over time and contexts, teams and their members continually cycle and recycle. ... team performance, while an output at time t_n , is an input and a part of the process leading to performance output at time $t_n + 1$." The feedback loop represents the effect of team outcomes influencing on-going team inputs as well as process and emergent states. Specifically, this accounts for the fact that individuals and teams are learning entities that adapt and adjust to environmental changes and entities that are capable of modifying and developing over time.

3. Review of articles

Below in our brief overviews of the articles presented in this special issue, we discuss the primary focus of each article and what factors the articles present in terms of the IPO. The first paper is by Shannon Marlow, Christina Lacerenza, and Eduardo Salas and is titled "Communication in virtual teams: A conceptual framework and research agenda." While communication is a critical process in teams, the authors point out it has often been conceptualized and operationalized in different ways. To provide clarity, they distinguish between three different forms of communication. They describe which communication features are essential to virtual teams in facilitating emergent states of trust and cognition and how virtuality moderates the emergent states and process relationships with performance. The article presents an adaptation of the IPO model with team diversity as a team composition input, communication as a process, trust and cognition as emergent states, virtuality, interdependence and task complexity as moderators, and performance, satisfaction and viability as outputs. Based on the model, they present a number of propositions

The second paper is by Jennifer Gibbs, Anu Sivunen, and Maggie Boyraz and is titled "Investigating the impacts of team type and design on virtual team processes." The authors provide a comprehensive review and analysis of virtual team research over the past 15 years. They highlight a number of reoccurring themes. Specifically they examine the results on leadership, cultural composition, and technology use and compared the differences in results due to study design, team type, and configuration. The article presents findings, such as the fact that the use of field versus laboratory study settings influences differences in study results. Furthermore, they highlight that the role of strong and weak leadership approaches has been discussed both simultaneously and sequentially, over time. In terms of the IPO, it could be argued that the article focuses on leadership and culture as inputs and the behavioral process of technology use, and the (student versus field) setting as a moderating variable.

The third paper is by William Kramer, Marissa Shuffler, and Jennifer Feitosa and is titled "The world is not flat: Examining the interactive multidimensionality of culture and virtuality in teams." The authors provide a review of major culture theories and present research propositions on the effects of culture dimensions on the modes of communication and information tools used by virtual team members to interact virtually. Cultural theories discussed include Hofstede's (1984) cultural dimensions theory, Triandis' (1995)

cultural typology, Trompenaars' model of natural cultural differences (Trompenaars & Hampden-Turner, 1998), Hall's (1976) high- and low-context culture dimension theory, and Pelto's (1968) tight and loose culture theory. The paper provides a helpful compilation and overview of these cultural theories. While there is overlap among some of the theories, each provides insight into the effects of cultural dimensions (characterizing a team) on communication tools in terms of type of informational value and synchronicity. The authors discuss their expectations of cultural dimensions and offer an agenda to guide research. With respect to the IPO model, this paper focuses on the input of team composition in terms of culture and the behavioral process of communication.

The fourth paper is by Mark Roehling and is titled "The important but neglected legal context of virtual teams: Research implications and opportunities." A primary premise of the article is that there has been a relative lack of research attention to the legal context of virtual teams, in contrast to the attention given to the influence of the legal environment on many other HRM practices. In actuality, the legal contexts where virtual team members are located can potentially impact the adoption and function of virtual teams. For example, globally dispersed teams present complexity and uncertainty resulting from the potential difficulty of determining which country's or countries' work place laws or intellectual property laws apply to the virtual team members. The author discusses a number of relevant issues that should be considered and receive research attention, to more fully inform the use of virtual teams. Finally, with respect to the IPO, the paper's focus is on the moderator team context in terms of the legal environments in which virtual team members operate.

The fifth paper is by John Schaubroeck and Andrew Yu and is titled "When does virtuality help or hinder teams? Core team characteristics as contingency factors." The article presents a theoretical framework that draws on Hollenbeck, Ellis, Humphrey, Garza, and Ilgen (2011) who identified skill differentiation, temporal stability, and authority differentiation as the core dimensions that distinguish different types of teams. The authors discuss the implications of levels of virtuality on the core dimensions. Specifically, through applying the three dimensions, they determine how they are differentially associated with the level of utilization of technology-mediated communication technologies, as a measure of virtuality. For example, team performance, at high levels of virtuality, can be augmented by high authority and centralization, a minimum level of skill differentiation among the team members, and a longer-term perspective. With respect to the IPO, the paper presents the input of team design (temporal stability), skill differentiation, and leadership (authority differentiation); the behavioral process of communication (utilization of technology mediated communication); and team efficiency, innovation, learning and adaptation, and member satisfaction as outcomes.

The sixth paper is by Chenwei Liao and is titled: "Leadership in virtual teams: A multilevel perspective." The author discusses the idea of a multi-level approach toward the functioning of leadership in virtual teams. A review of the literature indicates that research on virtual team leadership and its effects on processes has largely been focused at the team level. In practice, virtual team leader activities also involve interactions with individual team members, which are of particular importance given that members in virtual teams are often geographically dispersed. Consequently, a primary premise of the article is that a multi-level approach is needed when studying virtual team leadership because leader behaviors influence both virtual team processes and individual members. To that end, this article extends the IPO model to include a multi-level perspective and presents the input of leader behaviors at both the team and individual levels, team and individual processes and emergent states, and the outcomes of team effectiveness and individual effectiveness. Finally, the moderators of task complexity, task interdependence, and virtuality are considered.

The seventh paper is by James Schmidtke and Anne Cummings and is titled, "The effects of virtualness on teamwork behavioral components: The role of shared mental models." Shared mental models have been used to explain collocated team performance differences and how team members cope with challenging and changing task conditions (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). Specifically, shared mental models refer to team members holding similar cognitive representations, or having a shared understanding, of the team's task requirements, procedures, and role responsibilities (Mohammed & Dumville, 2001). In spite of their importance as an emergent state, the inclusion of shared mental models in research on virtual team literature has been limited. The paper discusses the role of shared mental models in virtual teams and the increased importance of similar and accurate team mental models when the level of virtuality, and thus complexity, of the environment, increases. Finally, the paper identifies specific training practices that can facilitate shared mental models in virtual teams. In terms of the IPO framework, inputs including training, team mental models as an emergent state, virtuality as a moderator, and behavioral outcomes.

The eighth paper is by Julia Hoch and James Dulebohn and is titled "Team personality composition, emergent leadership and shared leadership in virtual teams: A theoretical framework." In the article the authors highlight that while research on collocated teams has demonstrated that personality dimensions influence team processes and outcomes, there has been limited research attention on the role of personality dimensions in virtual team composition. In response, the paper extends findings from collocated teams on team personality composition, in terms of the Big Five dimensions, to virtual teams. With respect to the IPO, they include the input of team composition (in terms of team personality), processes of shared and emergent leadership, virtuality as a moderator, and team performance as an outcome. The paper presents associations of team personality composition on the behavioral processes of shared leadership and emergent leadership on team performance and the authors a number of research propositions.

4. Conclusion

Contemporary organizational trends in the adoption and widespread use of virtual teams highlight the need and provide the impetus for advancing theory and research on virtual teams. Thus, the overall objective of this special issue is to contribute to the need for scholarship on virtual teams. The eight articles advance theory on virtual teams and provide directions for research on the topic. We hope that this special issue will benefit both researchers and practitioners and will ultimately help inform the use and management of virtual teams in organizations. Finally, we want to thank Dr. Rodger Griffeth, Dr. Dianna Stone, and Dr. Howard Klein, along with

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