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The role of temporal coordination for the fuzzy front-end of innovation in virtual teams

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ABSTRACT

In this paper, we study the role of temporal coordination in managing the early stages of innovation (aka fuzzy front-end) in the context of virtual teams. Following a comparative case study approach, we detail the role of temporal coordination through the study of two contrasting virtual teams—one with a 24-h lifespan, and one with a five-month lifespan—from two Industry-Academia collaboration projects. Our approach was longitudinal capturing virtual team activities from start to end of each project, and involved multiple data collection methods, including observations and interviews. The findings reveal that the virtual team lifespan influences the type of temporal coordination that emerges. In virtual teams with short lifespans, *tight coordination* with frequent communication can help to reduce the uncertainty characterizing the fuzzy front-end. On the other hand, in virtual teams with longer lifespans, *loose coordination* allows dispersed members to work simultaneously on different, complementary aspects of the task at hand. These findings extend scholarly understanding around how innovation activities are coordinated in technology-mediated environments, such as virtual teams. Finally, we discuss theoretical and managerial implications.

1. Introduction

There is widespread recognition that innovation projects take place in geographically dispersed, technology-mediated, thus virtual teams (VTs) (Chamakiotis & Panteli, 2017; Olaisen & Revang, 2017). Within this context, researchers have studied how innovation develops (e.g. Gibson & Gibbs, 2006; Kratzer, Leenders, & Van Engelen, 2006), shedding light on various aspects of innovation including the impact of anonymity on idea generation (Chen, Zhang, & Latimer, 2014), creativity and ideation in the technology-mediated setting (Chamakiotis, Dekoninck, & Panteli, 2013) as well as the coordination of VT processes (Peñarroja, Orengo, Zornoza, & Hernández, 2013), and VT interactions (Baruch & Lin, 2012). Despite these studies, limited knowledge exists on how the temporary aspect of VTs, i.e. their short lifecycle, may influence innovation.

Temporary organizing constitutes a unique organizational form, which influences task and team processes (Bakker, DeFillippi, Schwab, & Sydow, 2016; Burke & Morley, 2016). In the VT context, temporary VTs appear to have a typically short and predefined lifespan (Panteli & Davison, 2005; Saunders & Ahuja, 2006). Such short VT lifecycle is not without challenges; it may have an adverse effect on the quality of relationships and interactions among team members, especially on the development of trust and team cohesion (Crisp & Jarvenpaa, 2013; Gibbs, Sivunen, & Boyraz, 2017); and also on teams' ability to innovate and meet their goals, by challenging team climate and enhancing outcome uncertainty (Halbesleben, Novicevic, Harvey, & Buckley, 2003; Nisula & Kianto, 2016). As innovation efforts nowadays are increasingly conducted in temporary (e.g. Bakker, Boroş, Kenis, & Oerlemans, 2013) and virtual (e.g. Olaisen & Revang, 2017) environments, it becomes vital for project managers to understand how innovation plays out within the temporary VT context.

In particular, our study takes a focus on the fuzzy front-end (FFE) of innovation, whose importance has been seen as burgeoning in the innovation literature (Spieth & Joachim, 2017; Takey & Carvalho, 2016). The FFE represents the early phase of the innovation process, where ideas are generated and evaluated, potential concepts are formulated, and further development is initially planned (Kock, Heising, & Gemünden, 2015; Oliveira & Rozenfeld, 2010). Studying the impact of temporary VTs on the FFE is essential for two reasons. First, the highly unstructured and complex nature of FFE activities—combined with the temporary and virtual nature of contemporary innovation teams—could significantly influence the overall development cost and project

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success (Verworn, Herstatt, & Nagahira, 2008; Yoo, Boland, Lyytinen, & Majchrzak, 2012). Also, members of temporary VTs may not have the opportunity to develop strong interpersonal relationships or trust, which may have an impact on their level of creativity (Gibbs et al., 2017). Hence, we argue that VTs with a short lifespan and limited potential for relationship building require different coordination practices to meet the same innovation objectives as permanent VTs, or temporary ones with a longer lifespan. Though the challenging nature of the FFE has been recognized in the innovation field (Christiansen & Gasparin, 2016; Spieth & Joachim, 2017; Tran, Goulding, & Shiu, 2018), scarce evidence exists around the temporary character of VTs in relation to the FFE or the innovation literature more generally.

Following from the above, our research question is: How does the temporary character of VTs influence the coordination of the FFE activities in the VT context?

To address our research question, we adopt a comparative case study approach with two contrasting temporary VTs from different Industry-Academia collaboration projects representing two extremes of a temporal continuum. We use qualitative methods (e.g. observations, interviews) and contribute to the literature on VTs by exploring how the temporary character of VTs influences the coordination of the FFE of innovation extending prior relevant work (e.g. Montoya-Weiss, Massey, & Song, 2001). The study offers valuable insights to project managers on effective coordination practices that may be adopted within technology-mediated environments, such as VTs.

We start by reviewing relevant literature, and then turn to the presentation of our research sites and findings from the two cases. We subsequently bring the two cases together, and discuss the ensuing findings, as well as their theoretical and managerial implications.

2. Virtual teams and temporal coordination

There is agreement in the VT literature that VTs are different from traditional, physically collocated teams because of their unique characteristics: they are technology-dependent and dispersed in terms of *geography* (comprising geographically dispersed members), *organization* (comprising members of different parent organizations), and *temporal differences*. VTs, irrespective of their lifespan, may constitute ideal environments for innovation, due to their potential to access geographically dispersed talent, thus connecting members with expertise which is not available locally (Chamakiotis & Panteli, 2017; Chamakiotis et al., 2013; Chen et al., 2014; De Leede, Kraan, Den Hengst, & van Hooff, 2008; Kratzer et al., 2006). Thus, VTs can be highly creative due to the interdependencies that are formed among the specialized team members, like other temporary project teams (Manning & Sydow, 2007). Further, members' dispersion across different time zones and the opportunity to work 'following the sun' may enhance speed and quality that can aid innovation (Colazo & Fang, 2010).

Nevertheless, the very same characteristics that provide such opportunities for innovation have also been recognized as discontinuities (Chudoba, Wynn, Lu, & Watson-Manheim, 2005), bringing inconsistencies to VT operations. In particular, temporary VTs, due to their short and intense lifecycle, have been seen as creating challenges for their management, levels of cohesion, trust development, internal team conflict, and ultimately, their performance (Gibbs et al., 2017; Massey, Montoya-Weiss, & Hung, 2003; Montoya-Weiss et al., 2001).

Through temporal coordination mechanisms, these challenges, such as the ones noted above, can be overcome (Ancona, Okhuysen, & Perlow, 2001) and turn to opportunities for creativity and innovation. Temporal coordination has been defined as a process structure aiming to intervene and direct patterns, timing and content of communication in a group (Montoya-Weiss et al., 2001). This form of coordination is important in VTs as it seeks to structure activities across time and space and thus achieve integration of inter-dependent activities in the technology-mediated context. Within VTs, coordination can be achieved through temporal symmetry, thus the synchronization of activities, or temporal complementarity which entails first the division of activities and then their synthesis (Im, Yates, & Orlikowski, 2005). Some literature looks into the impact of temporal coordination on managing conflict and performance within VTs, though the focus of these studies has often been on asynchronous VTs in contrived experimental environments (i.e. Chen et al., 2014; Massey et al., 2003; Montoya-Weiss et al., 2001). Limited insights therefore exist in the literature on temporal coordination in other types of technology-mediated settings (Shen, Lyytinen, & Yoo, 2014). We will be exploring this issue by examining how temporal coordination unfolds in the FFE phase of innovation within VTs.

3. The fuzzy front-end of innovation

The innovation stream has gradually shifted from viewing the management of innovation process as a whole into two distinct but interrelated streams, due to the diverse nature of the tasks performed and objectives set in each one: the front-end phase, or FFE, and the back-end phase (Kim & Wilemon, 2002; Oliveira & Rozenfeld, 2010). Whereas the back-end phase relates to the actual development of the product/idea, its financial viability and market launch (Khurana & Rosenthal, 1998), the FFE begins *"when an opportunity is first considered worthy of further ideation, exploration, and assessment and ends when a firm decides to invest in the idea, commit significant resources to its development"* (Kim & Wilemon, 2002; p. 270).

Key FFE activities include: preliminary market assessment, opportunity identification and assessment, idea generation, concept testing, product definition and project planning (Khurana & Rosenthal, 1998). As these activities span between the first consideration of an idea to the actual beginning of the product development process, key decisions are required during the FFE; from organizing a multifunctional development team, through setting clear phase goals, to allocating scarce resources for product development (Khurana & Rosenthal, 1998). Hitherto, as the FFE can have a strong impact on sequential innovation stages, managers need to focus on the most attractive products for customers and terminate the less viable ones as early as possible (Kock et al., 2015).

Due to these diverse and often resource-depleting activities, the FFE remains highly labyrinthine, unstructured and uncertain (Frishammar, Florén, & Wincent, 2011), featuring as the most vital phase of the innovation process to manage (e.g. Spieth & Joachim, 2017; Thanasopon, Papadopoulos, & Vidgen, 2016). The extant literature has examined: how various organizational conditions (e.g. climate) contribute to FFE quality and front-end success (Bertels, Kleinschmidt, & Koen, 2011); the impact of task execution proficiency and decision criteria on following FFE activities and product development success (Khurana & Rosenthal, 1998; Verworn et al., 2008); the role of technical uncertainty (Spieth & Joachim, 2017; Verworn et al., 2008); and how the early stages of radical and incremental innovations should be differently managed (Salomo, Keinschmidt, & De Brentani, 2010). More recently, the literature has focused on 'openness competence' within the FFE (Thanasopon et al., 2016), and on the resources' requirements and creativity during FFE, with researchers shedding light on: collaboration and coordination practices within the FFE (Takey & Carvalho, 2016); how ideas can be created, selected and successfully implemented (Kock et al., 2015); and on top management's participation in the FFE (Globocnik & Salomo, 2015).

Despite the usefulness of the aforementioned insights, the temporary character of VTs is likely to challenge the prescriptions of the VT literature for three reasons (Watson-Manheim, Chudoba, & Crowston, 2012). First, the idea generation phase might be compromised, due to limited brainstorming and higher communication barriers between members from multiple functions with diverse background (Kock et al., 2015; van den Ende, Frederiksen, & Prencipe, 2015). Second, decision-making uncertainty could be escalated, due to the increased pressure