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Preparing for distant collaboration: Antecedents to potential absorptive capacity in cross-industry innovation

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ABSTRACT

Cross-industry innovation entails distinctive innovation opportunities and challenges according to the knowledge heterogeneity between the collaborating firms. This heterogeneity yields increases in organizational-level cognitive distance. Whereas recent theory suggests cognitive distance is positively related to exploratory innovation, too much distance can hinder efficient knowledge absorption and results in a reduced effect on novelty value. This paper focuses on the research question of how to build potential absorptive capacity for distant collaboration beyond established industry boundaries to gain radical rather than incremental results. To address this question, we mapped a cross-industry network using survey data on 215 bilateral cross-industry collaborations between firms from a variety of industries and captured cognitive proximity (the inverse of distance) in terms of overall knowledge redundancy between firms. This approach introduces a new method to infer organizational-level cognitive distance from network analysis. Subsequently, based on results from the network analysis, we examined coordination antecedents to potential absorptive capacity for cross-industry innovation with partners at moderate and high distance applying case study analysis. Our study revealed three alternative approaches to coordination antecedents that drive a firm's potential absorptive capacity for distant collaboration. These findings extend research on absorptive capacity to the field of cross-industry innovation.

1. Introduction

Firms are increasingly compelled to enhance or sustain their competitive advantage by exploiting existing and exploring new knowledge for innovation (Jansen et al., 2006). The notion of organizational ambidexterity (Duncan, 1976; Tushman and O'Reilly, 1996) has emerged as a crucial concept in research on organizations (Raisch et al., 2009). Ambidextrous firms gain sustainable competitive advantage by exploiting existing knowledge while simultaneously exploring new knowledge and opportunities (March, 1991; Levinthal and March, 1993). Exploitative innovations are incremental innovations which build on existing knowledge, thereby broadening a firm's existing knowledge base and improving established products without changing the basic nature of existing skills, processes, and structures. Conversely, exploratory innovations are radical innovations which require new knowledge, departing from a firm's existing knowledge base and thereby offering fundamentally new products (Jansen et al., 2006; March, 1991).

Overall, the combination of exploitation and exploration helps firms to enhance performance (Lin et al., 2013; Gibson and Birkinshaw, 2004; He and Wong, 2004); however, this combination is difficult to achieve due to restricted organizational resources (for a detailed literature review on antecedents to enable ambidexterity see O'Reilly and Tushman, 2008; Raisch and Birkinshaw, 2008). Therefore, a growing body of literature stresses the importance of inter-firm ambidexterity and describes firms that are capable of simultaneously pursuing exploitation and exploration through collaborative innovation (Raisch et al., 2009). Chesbrough (2003) revitalized the idea of collaborative innovation, which has as its most prominent objective the combination of collaboration partners' distinctive yet complementary knowledge to strengthen internal knowledge bases in a value adding way (see also Teece, 1986; Von Hippel, 1988; Brockhoff et al., 1991; Hagedoorn, 1993; Hagedoorn and Duysters, 2002). This rationale provides the foundation for the view that firms access knowledge from sources outside their boundaries to create value for both exploitative and exploratory innovation activities (Koza and Lewin, 1998). Several studies have substantiated the potential of inter-firm ambidexterity to balance exploitative and exploratory innovation within separate collaborations to reduce the inherent tensions of resource allocation (Holmqvist, 2004; Lavie and Rosenkopf, 2006; Rothaermel and Deeds, 2004). Thereby, exploratory

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innovation, which provides greater growth opportunities, but is a harder and higher risk for a firm than exploitative innovation (Danneels, 2002), is more likely to emerge when heterogeneity in collaboration partners' knowledge is high to produce a Schumpeterian novel combination (Nooteboom et al., 2007).

In this study, we concentrate on the concept of cross-industry innovation, specifically the application of established knowledge or technologies of partners from outside a firm's own value chain, as this provides a specific inter-organizational setting in which to pursue exploratory innovation (Enkel and Gassmann, 2010; Gassmann et al., 2010; Herstatt and Kalogerakis, 2005). Whether the partners in cross-industry collaboration gain radical rather than incremental results depends on the knowledge heterogeneity between the collaborating firms, referred to as organizational -level cognitive distance. Nooteboom (1999) proposed an inverted U-shaped relationship between cognitive distance and innovation performance. He and others found that innovation potential increases as cognitive distance increases (Nooteboom et al., 2007; Wuyts et al., 2005; Gilsing et al., 2008). However, when cognitive distance reaches a certain degree, its effect on novelty value is reduced, as too much diversity hinders efficient absorption (Cohen and Levinthal, 1990).

Rindfleisch and Moorman (2001) approached the concept of cognitive distance effectively and argued that shared basic perceptions and beliefs are associated with a high degree of redundancy among innovation partners' knowledge bases. Knowledge redundancy among firms denotes a broad range of conditions for cognitive proximity (the inverse of distance). Recent research has considered cognitive distance between alliance partners using cognitive proximity in terms of correlation between technological knowledge, as inferred from patent data (Nooteboom et al., 2007; Wuyts et al., 2005; Gilsing et al., 2008; Petruzzelli, 2011), or evaluation of distances according to industry standard classification systems (Li and Vanhaverbeke, 2009; Enkel and Gassmann, 2010). Because industry standard classification systems are only a raw proxy for measuring inter-industry differences, no measure has been developed yet to assess cognitive distance in advance, before patent results are created, to select which partners from which industry are more likely to generate exploratory rather than exploitative innovation. Moreover, because patent data can only be attributed to a firm's unique set of alliance partners (Nooteboom et al., 2007), there are no learning processes for the future selection of new partners from different industries. Furthermore, the aforementioned contributions provide notable insights into the architecture of inter-organizational arrangements that achieve a delicate balance between novelty creation on one hand and its efficient absorption on the other (Gilsing et al., 2008; Li and Vanhaverbeke, 2009; see also Gilsing and Duysters, 2008; Spithoven et al., 2011). For instance, as empirically indicated by Gilsing et al. (2008), firms operating from a peripheral network position outside the immediate sight of more central players are in a more favored position to develop exploratory innovations with partners at a very large distance, with more central firms exhibiting relatively low performance. However, there is a lack of research about specific firm level activities that build absorptive capacity for distant collaboration (Nooteboom et al., 2007). Although some studies have focused on how distant knowledge can be accessed (Rosenkopf and Nerkar, 2001; Rosenkopf and Almeida, 2003; Ahuja and Katila, 2004), they have provided no insight into how distant knowledge, once accessed, can also be adequately absorbed. Thus, we aim at closing these gaps by investigating which cognitive distance partners from various industries yield and elaborate on organizational coordination antecedents to build potential absorptive capacity (Jansen et al., 2005) as a pre-condition for knowledge absorption in distant collaboration beyond established industry boundaries.

The remainder of this paper is organized as follows. First, we provide a theoretical background on collaborative innovation performance in terms of industry differences and reconsider how cognitive distance and potential absorptive capacity mediate this relationship. Second, we present the data and cross-industry network analysis used to estimate cognitive distance between firms. Third, drawing on results from the network analysis, we describe the case selection and analysis. After presentation of our case study results, we conclude by discussing the academic and managerial implications of our research, reviewing limitations and suggesting directions for future research.

2. Theoretical background

2.1. Cross-industry innovation potential

The core logic from recent research on inter-firm ambidexterity and cross-industry innovation holds that companies form collaborations to combine their own knowledge with that of partners as a potential source of both exploitative and exploratory innovation (Lavie and Rosenkopf, 2006; Enkel and Gassmann, 2010). Underlying this logic is Schumpeter's (1939) proposition that most innovations are the result of a recombination of existing knowledge in a new context or constellation and, therefore, are often not based on knowledge that is new to the world (Henderson and Clark, 1990; Kogut and Zander, 1992; Hargadon, 2002). An effective means for the creation of inventive recombination is the use of analogy when applying knowledge from an existing domain to a different domain that requires explanation (Keane, 1987; Reeves and Weisberg, 1994; Holyoak and Thagard, 1995). This approach is rooted in broader conceptual discussions on 'analogical thinking' (Gentner, 1983; Gick and Holyoak, 1980) or 'lateral thinking' (De Bono, 1968) and is mostly limited to knowledge or technology advanced within a firm or, at the least, within supply chain partners in the same industry.

Hargadon and Sutton (1997) described the approach from a cross-industry perspective by analyzing the systematic and deliberate use of analogies within product design and development services for transferring solutions between various industries and areas of expertise (see also Hargadon, 2002, 2003). In this setting, managers draw on their broad expertise in different fields and function as knowledge brokers by inferring analogies between current design problems and other solutions they have seen to retrieve knowledge and create novel solutions to the original problem. Finally, several studies have built further on these insights, focusing on the antecedents and consequences of analogy use for specific and properly defined design and development tasks, in particular examining how relevant knowledge is accessed from different industries (Dahl and Moreau, 2002; Gavetti et al., 2005; Gassmann and Zeschky, 2008; Kalogerakis et al., 2010; Poetz and Prügl, 2010).

Following these contributions, cross-industry innovation is based on the approach of analogical thinking as an important source of innovation through transfer of an application in one industry to an application in a different industry (Enkel and Gassmann, 2010; Gassmann et al., 2010; Brunswicker and Hutschek, 2010). A number of prior studies have provided empirical evidence showing that crossing domain-specific boundaries is likely to result in breakthrough or radical innovation outcomes (Enkel and Gassmann, 2010; Kalogerakis et al., 2010; Poetz and Prügl, 2010; Li and Vanhaverbeke, 2009; Datta and Jessup, 2013). In a similar vein, Jeppesen and Lakhani (2010), who first investigated the broadcast search method, found that innovative solutions are mainly held by problem solvers with a large distance between the original problem situation and the solver's own area