



Inter-organizational knowledge acquisition and firms' radical innovation: A moderated mediation analysis[☆]

Xuemei Xie^{a,*}, Lijun Wang^a, Saixing Zeng^b

^a School of Management, Shanghai University, Shanghai 200444, China

^b Antai School of Management, Shanghai Jiao Tong University, Shanghai 200052, China

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ABSTRACT

Inter-organizational knowledge acquisition has become an increasingly important strategy for firms to improve their levels of innovation. Building upon the knowledge-based view (KBV) and the organizational learning perspective, and using data from 376 high-tech Chinese firms, we examine the underlying mediating mechanisms and contextual conditions in the relationship between inter-organizational knowledge acquisition and firms' radical innovation. Our results demonstrate that inter-organizational knowledge acquisition has a significant positive impact on firms' radical innovation. We also find that realized absorptive capacity mediates the relationship between inter-organizational knowledge acquisition and firms' radical innovation. Moreover, we discover that knowledge ambiguity negatively moderates both the direct and indirect effects of inter-organizational knowledge acquisition on firms' radical innovation through realized absorptive capacity. Our findings contribute to open innovation research by discussing the mediating mechanisms of how inter-organizational knowledge acquisition can be converted to firm innovation via realized absorptive capacity. Our results also provide fine-grained insight into the contingent role of knowledge ambiguity, and how its interaction with inter-organizational knowledge acquisition and realized absorptive capacity can have profound effects on firms' innovativeness.

1. Introduction

The knowledge-based view (KBV) highlights the facts that knowledge is the most strategically significant resource of a firm and that the ability to generate, combine, recombine, and exploit knowledge is essential to a firm's ability to innovate (Grant, 1996; Szulanski, Ringov, & Jensen, 2016; Wang, 2013). However, firms do not always have all the knowledge they require (Parra-Requena, Ruiz-Ortega, García-Villaverde, & Rodrigo-Alarcón, 2015). To sustain a competitive advantage in dynamic industries where new knowledge emerges frequently, firms must continually generate flows of new knowledge in order to accumulate and renew their portfolio of knowledge stock (Lin & Wu, 2010).

Rapidly transforming information technologies have brought about a situation in which the knowledge that a firm requires for innovation may be found outside of the firm's boundaries (Segarra-Ciprés, Roca-Puig, & Bou-Llusar, 2014). In this vein, inter-organizational collaboration is increasingly seen as a means to broaden a firm's knowledge base and to create new and innovative knowledge combinations based on the

knowledge of partner firms (Björkman, Stahl, & Vaara, 2007). Accordingly, inter-organizational knowledge acquisition that is achieved through collaborative relationships has become a vital strategy for firms to obtain crucial technical knowledge and to conduct innovative advances, hence gaining a sustainable competitive advantage (Buckley, Glaister, Klijn, & Tan, 2009; Chen & Tan, 2016; Ho, Ghauri, & Larimo, 2017; Lyles & Salk, 2007; Parra-Requena et al., 2015).

In recent years, the increasing importance of knowledge acquisition has triggered numerous studies on its antecedents and consequences. Some researchers focus on the antecedents affecting knowledge acquisition, such as internal research and development (R&D) (e.g., Denicolai, Ramirez, & Tidd, 2016), trust among partners (e.g., Geneste & Galvin, 2013), strategic orientation (e.g., Ma & Huang, 2016), and institutional distance (e.g., Ho et al., 2017). Other studies investigate the indirect role of knowledge acquisition, such as its mediating role (e.g., Chang, Bai, & Li, 2015; Ma & Huang, 2016; Parra-Requena et al., 2015). In addition, there is research that examines the consequences of knowledge acquisition, including the effect of knowledge acquisition on both firm performance and firm innovation (e.g., Denicolai et al., 2016;

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* Corresponding author.

E-mail addresses: xxm1030@126.com (X. Xie), wanglijun7@i.shu.edu.cn (L. Wang), zengsaixing@sjtu.edu.cn (S. Zeng).

Liao & Marsillac, 2015). Yet, little research has offered a comprehensive perspective on the effectiveness of knowledge acquisition through inter-organizational collaboration. Although some conceptual and qualitative studies link knowledge acquisition from external sources to firm innovation (e.g., Arvanitis, Lokshin, Mohnen, & Wörter, 2015; Chen & Huang, 2009; Liao & Marsillac, 2015; Pattinson & Preece, 2014; Sullivan & Marvel, 2011; Yli-Renko, Autio, & Sapienza, 2001; Zhou & Li, 2012), a systematic overview of the underlying mechanisms and contextual conditions of the relationship between inter-organizational knowledge acquisition and firms' innovativeness is still lacking. These gaps in the literature limit our understanding of the true contribution of inter-organizational knowledge acquisition to firms' innovativeness.

One particular research gap is that it has remained unclear how the technological knowledge that a firm obtains from its partners contributes to the firm's radical innovation. Although technical knowledge acquired via collaboration is critical for enhancing firm innovation (Frankort, 2016), this does not mean that that knowledge can be used automatically or efficiently by the receiving firm (Vanhaverbeke & Cloudt, 2014). Therefore, knowledge acquisition is necessary but not sufficient to turn the newly acquired knowledge into marginally improved products or services (Limaj & Bernroider, 2017). Although previous literature indicates that knowledge acquisition has a positive effect on firms' innovation output (e.g., Frankort, 2016; Kotabe, Jiang, & Murray, 2011), the studies do not examine what internal mechanisms might be involved in this relationship. Given that the different impacts of external knowledge on innovation depend on the capabilities of firms to apply this knowledge (viz., realized absorptive capacity) (Ferrerias-Méndez, Fernández-Mesa, & Alegre, 2016; Kotabe et al., 2011; Lin, Zeng, Liu, & Li, 2016), we argue that the inclusion of realized absorptive capacity as a mediating factor may provide most of the explanatory power of radical innovation and, further, that it can clarify the weakness of the effect that is directly attributed to inter-organizational knowledge acquisition.

A second gap in the literature concerns the context of when the external knowledge to be transferred is ambiguous or not made explicit. In these cases, it is unclear whether the external knowledge from partners contributes to a firm's radical innovation. Knowledge ambiguity, as an essential knowledge characteristic, is a fundamental factor to be considered in the process of knowledge management (Law, 2014; Simonin, 2004; van Wijk, Jansen, & Lyles, 2008). Accordingly, knowledge ambiguity becomes an inherent and intractable challenge for both inter-organizational knowledge acquisition and transformation processes (Fang, Yang, & Hsu, 2013; Narteh, 2008). Hence, knowledge ambiguity determines the context of when external knowledge can effectively be transformed into firm innovation. Given that previous work fails to take sufficient account of the challenges in applying external knowledge (Robertson, Casali, & Jacobson, 2012), we aim to integrate the impact of knowledge ambiguity in our research model to examine whether the relationship between inter-organizational knowledge acquisition and radical innovation varies across the levels of knowledge ambiguity.

Based on the above research gaps, we propose that the effect of inter-organizational knowledge acquisition on radical innovation must be considered together with a firm's realized absorptive capacity, based on the contingent role of knowledge ambiguity. Thus, this study examines how realized absorptive capacity and knowledge ambiguity may condition the effect of the inter-organizational knowledge acquisition on firms' radical innovation. At the inter-organizational-collaboration level, we contribute to open innovation research by identifying the integration mechanisms of how inter-organizational knowledge acquisition can be exploited to promote firms' radical innovation through the role of realized absorptive capacity. Moreover, using a moderated

mediation model, we provide a better understanding of the contingent role of knowledge ambiguity by identifying how its interaction with inter-organizational knowledge acquisition and realized absorptive capacity may affect firms' radical innovation.

The remainder of this paper is organized as follows. Section 2 discusses the development of our theoretical hypotheses. Section 3 describes the variables and the data. Section 4 provides our empirical findings. Finally, in Section 5, we present our theoretical contributions, managerial implications, the limitations of this research, and possible future research directions.

2. Theoretical development and hypotheses

2.1. Inter-organizational knowledge acquisition and radical innovation

Faced with the knowledge-intensive business environment, firms are urged to leverage inter-organization relationships to actively acquire new knowledge from beyond their own organizational boundaries in order to develop new knowledge with partners and to effectively promote innovation output (Ahuja & Katila, 2001; Cassiman & Veugelers, 2006; Chung & Yeaple, 2008; Morgan & Berthon, 2008). Here, inter-organizational knowledge acquisition is defined as the interactive and iterative processes of firms to acquire new technology and know-how from external sources and partners (Liao & Marsillac, 2015; Zahra & George, 2002). Inter-organizational knowledge acquisition generally includes various sources, ranging from contract-based agreements, such as licenses, patents, and technological assistance, to equity-based arrangements, such as strategic alliances and joint ventures (Almeida, Dokko, & Rosenkopf, 2003; Simonin, 1999; Zhang, Shu, Jiang, & Malter, 2010).

Radical innovation is defined as the fundamental changes in a firm's technological trajectory, which involves the development of new products, services, or production processes for new customers or emerging markets (Benner & Tushman, 2003; Song & Thieme, 2009). According to KBV, a firm's knowledge base affects its scope and capacity to comprehend and apply novel knowledge to radical innovation (Hill & Rothaermel, 2003). Given that no firm possesses all necessary resources internally and that it is imprudent to undertake all innovation activities alone (Lin et al., 2016), acquiring external knowledge becomes an advantageous approach to inspire radical innovation. In this vein, inter-organizational knowledge acquisition, which can help a firm obtain and accumulate external knowledge and expand their knowledge pool to pursue innovation (Cui, Griffith, & Cavusgil, 2005; Kotabe et al., 2011), is recognized as fundamental for improving a firm's radical innovation.

On the one hand, inter-organizational knowledge acquisition can help firms access their partners' broad knowledge-based resources and capabilities, which may enhance the breadth and depth of a firm's knowledge base (Liao & Marsillac, 2015). Thus, inter-organizational knowledge acquisition can help firms gain multi-channel access to new external knowledge and new technologies, enabling them to better utilize existing knowledge (Chang et al., 2015). Given that inter-organizational knowledge acquisition plays an important role in the creation of new knowledge (Julien, Andriambeloson, & Ramangalahy, 2004), a broad knowledge base can facilitate a firm's understanding of new information and potential changes, reduce their innovation expenditures, and enhance their ability to detect remote technological or market opportunities for radical innovation (Chesbrough, 2006).

On the other hand, as a collaborative process is composed of an extensive knowledge flow among the employees of different partners (Ma & Huang, 2016), the knowledge acquired from outside partners enables employees within a firm to deepen their thinking and to advance their innovative ideas (Chang et al., 2015), which can then have

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