



# When does knowledge acquisition in R&D alliances increase new product development? The moderating roles of technological relatedness and product-market competition



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## ABSTRACT

In studying the performance consequences of research and development (R&D) alliances, one stream of research has concentrated on the acquisition of partners' technological knowledge whereas another has focused on firms' new product development outcomes. Bridging these two research streams, this study directly connects knowledge acquisition through R&D alliances to new product development and examines when R&D alliances enable firms to apply acquired technological knowledge in the product domain. Using longitudinal and multisource data on a sample of firms engaged in R&D alliances in the information technology industry, I find that knowledge acquisition is on average positively associated with firms' numbers of new products. However, I also find that knowledge acquisition is substantially more beneficial for new product development both when firms and their partners are active in similar technology domains and when they operate in distinct product markets.

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## 1. Introduction

Research and development (R&D) alliances are formal agreements through which firms conduct joint research and development relating to new technologies, products, or processes, eventually with the objective to enable firms to bring new products to market (Hagedoorn, 1993). One stream of research has concentrated on the potential for technological learning through R&D alliances, showing that such alliances can enable firms to acquire technological knowledge developed by their alliance partners (Frankort, 2013; Frankort et al., 2012; Gomes-Casseres et al., 2006; Mowery et al., 1996; Oxley and Wada, 2009; Rosenkopf and Almeida, 2003). Another stream of research has focused instead on the role of R&D alliances in new product development, showing that such alliances may have consequences in the product domain as well (Chen and Li, 1999; Deeds et al., 1999; Deeds and Hill, 1996; Kotabe and Swan, 1995; Rothaermel and Deeds, 2004).

Nevertheless, in focusing virtually exclusively on either knowledge acquisition or new product development, both research streams have tended to underemphasize the relationship between

these two distinct outcomes.<sup>1</sup> Furthering the understanding of the relationship between knowledge acquisition through R&D alliances and new product development is critical, however, because the competitiveness of manufacturing firms engaged in research and development may not derive from knowledge acquisition per se; it is ultimately some function of whether they are able to apply acquired technological knowledge in the product domain (e.g., Blundell et al., 1999; Sorescu and Spanjol, 2008). Motivated by these observations, in this study I propose and test a conceptual framework that directly connects knowledge acquisition through R&D alliances to firms' new product development.

My starting point is constituted by narrative accounts suggesting that knowledge acquisition may represent a key mechanism linking firms' R&D alliances to new product development (e.g., Rindfleisch and Moorman, 2001; Soh, 2003). Specifically, I begin by arguing that acquired technological knowledge may generate opportunities for new product development both within and beyond the terms of a firm's R&D alliances and so one might expect a positive association between knowledge acquisition on the one

<sup>1</sup> While some studies have examined the role of alliances in shaping both upstream and downstream outcomes (e.g., Rothaermel and Deeds, 2004), even that research has not systematically considered the importance of technological knowledge acquired from alliance partners as a factor influencing new product development.

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hand and a firm's new product development on the other. In this study, knowledge acquisition is defined as the extent to which a firm's novel technological knowledge builds on technological content knowledge acquired from R&D alliance partners, while new product development refers to a firm's propensity to design, manufacture, and market products that are new to the firm (Eisenhardt and Tabrizi, 1995).

Next, while the acquisition of technological knowledge may increase the potential for new product development, it will simultaneously increase a firm's dependence on partners' tacit process knowledge necessary to apply acquired technological knowledge in the product domain. More specifically, knowledge acquisition intensifies demands both on a firm's ability to understand partners' tacit process knowledge and on partners' incentives to facilitate access to such strategic competencies (Gerwin, 2004). Therefore, drawing from research on interfirm learning (e.g., Lane and Lubatkin, 1998; Nooteboom et al., 2007) and interpartner competition (e.g., Hamel, 1991; Khanna et al., 1998), I argue that the new product development benefits from acquired technological knowledge will be especially pronounced when the technological knowledge bases of a firm and its R&D alliance partners are related and when a firm and its partners operate in distinct product markets.

I test these ideas using longitudinal and multisource data on a sample of 44 manufacturing firms engaged in R&D alliances in the information technology industry, where profitability depends critically on firms' propensities to bring new products to market (Bayus et al., 2003). The empirical results suggest that knowledge acquisition through R&D alliances has a positive association with firms' new product development. However, I also find that the new product development benefits from knowledge acquisition are significantly enhanced when firms and their partners are active in similar technology domains, while such benefits are substantially reduced instead when firms and their partners are active in identical product markets.

Integrating the insights from the knowledge acquisition literature with the literature on knowledge application (Fiol, 1996; Lane et al., 2006; Meier, 2011), this study fills a gap in the alliance literature by directly examining the role of R&D alliances in connecting firms' technology and product domains. Specifically, one contribution lies in offering a systematic assessment of whether knowledge acquisition through R&D alliances influences firms' new product development. The second contribution lies in showing that the knowledge acquisition association with new product development is subject to important scope conditions—specifically, those rooted in partners' levels of technological relatedness and product-market competition.

## 2. Theory and hypotheses

### 2.1. Knowledge acquisition through R&D alliances and new product development

Firms may use their R&D alliances to acquire technological knowledge otherwise unavailable internally (e.g., Gomes-Casseres et al., 2006; Mowery et al., 1996) and such knowledge acquisition can enrich firms' pools of commercialization options (Chen and Li, 1999; Fey and Birkinshaw, 2005; Grant and Baden-Fuller, 2004; Kotabe and Swan, 1995; Moorman and Slotegraaf, 1999). Therefore, firms acquiring more technological knowledge through R&D alliances may be more productive in developing new products than otherwise identical firms that acquire less technological knowledge from their alliance partners (e.g., Yli-Renko et al., 2001). Prior research suggests at least two distinct paths through which the acquisition of partners' technological knowledge may enhance

firms' new product development (Sampson, 2007: 366). On the one hand, knowledge acquisition directly enriches firms' pools of technological knowledge relevant to the development activities within the terms of their R&D alliances. On the other hand, acquired technological knowledge may also have broader relevance for new product development activities beyond firms' individual alliance projects. Indeed, once acquired, technological knowledge can in principal be applied to new products even beyond the terms of firms' R&D alliances (Hamel, 1991). Consequently, while technological knowledge may be acquired within specific R&D alliances, knowledge acquisition is likely to increase firms' rates of new product development more generally. I therefore predict the following baseline association between knowledge acquisition and new product development:

**Hypothesis 1.** Knowledge acquisition through R&D alliances is positively associated with a firm's new product development.

Prevailing alliance research provides no direct empirical evidence on this first hypothesis, even though it has alluded to the downstream importance of knowledge acquisition in R&D alliances (e.g., Rindfleisch and Moorman, 2001; Soh, 2003). However, prior studies would also suggest that straightforward application of knowledge in the product domain may not always be an inevitable consequence of acquiring partners' technological knowledge (e.g., Meier, 2011). Therefore, it is likely that several scope conditions underlie H1 and so I next identify two moderating factors that previous research suggests are important in shaping coordination and cooperation between alliance partners engaged in new product development (Gerwin, 2004). First, research on interfirm learning suggests that firms may vary systematically in their *abilities* to understand how partners' technological knowledge can be applied in the product domain (e.g., Lane and Lubatkin, 1998; Nooteboom et al., 2007). Second, research on interpartner competition would suggest that partners may also vary systematically in their *incentives* to facilitate a firm's new product development (e.g., Hamel, 1991; Khanna et al., 1998).

### 2.2. The moderating role of technological relatedness

The first moderating factor concerns the extent to which firms are able to understand how partners' technological knowledge can be applied in the product domain. Research on interfirm learning suggests that the relatedness of a firm's technological knowledge base to that of its partners is an important determinant of such ability (Cohen and Levinthal, 1990; Mowery et al., 1996; Nooteboom et al., 2007; Lane and Lubatkin, 1998). *Technological relatedness*, defined here as the extent to which the knowledge bases of a firm and its alliance partners cover similar technology domains, reflects the degree to which firms have experience solving comparable types of problems. Therefore, at a basic level technological relatedness reflects common content knowledge and so it increases a firm's understanding of the technological knowledge held by its partners (Lane and Lubatkin, 1998). More importantly, firms familiar with each other's knowledge domains have a common reference frame and so they are more likely to be deeply exposed to the tacit process knowledge embedded in each other's skills and routines (Zander and Kogut, 1995), which in turn facilitates richer communication and deeper mutual understanding. Consequently, at higher levels of technological relatedness, firms are better able to understand and share the more tacit process knowledge necessary both to identify commercial applications for acquired knowledge (Lane and Lubatkin, 1998) and to actually transform such knowledge into new products (Rindfleisch and Moorman, 2001).

Technological relatedness is likely to be especially relevant in exploitation activities, such as the application of acquired technological knowledge in the product domain studied here. Indeed,

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