



# Collaborative networks and product innovation performance: Toward a contingency perspective

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## ARTICLE INFO

### Article history:

Received 3 October 2007  
Received in revised form  
11 September 2008  
Accepted 26 December 2008  
Available online 29 January 2009

### Keywords:

Collaborative network  
Product innovation performance  
Absorptive capacity

## ABSTRACT

An increasing number of studies have examined the impact of collaborative networks on product innovation performance, but have produced inconsistent results. This research contributes to existing literature by examining how absorptive capacity affects the relationships between different types of partners and product innovation performance. The sample used in this research is drawn from the Taiwanese Technological Innovation Survey (TTIS) database. A moderated hierarchical regression approach is used to analyze the models, which are further explored by firm size and industry type. Some interesting findings appear. First, absorptive capacity positively moderates the impact of vertical collaboration on the performance of technologically new or improved products. Second, the effect of absorptive capacity on the relationship between supplier collaboration and the performance of new products with marginal changes varies based on firm size and industry type. Third, absorptive capacity negatively affects the relationship between customer collaboration and the performance of marginally changed products. Fourth, absorptive capacity positively affects the relationship between competitor collaboration and the performance of new products with marginal changes for large firms. Fifth, absorptive capacity negatively affects the relationship between collaboration with research organizations and the performance of technologically new or improved products. On the contrary, absorptive capacity positively affects the impact of collaboration with research organizations on the performance of marginally changed products. These results enrich current understanding of the relationships between collaborative networks and product innovation performance.

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## 1. Introduction

Given the intense competition in most markets today, companies are increasingly recognizing the necessity and advantages of regularly developing new products. Firms that introduce higher-quality products faster than their competitors usually earn higher economic returns (Datar et al., 1997). However, rapid changes in technology often force such firms to depend on external technological knowledge and skills in addition to internal technological resources. Many firms today are relying more extensively on external linkages to acquire new technological knowledge using strategies such as technology licensing and collaborative agreements. Inter-firm collaboration is an important vehicle for the creation of technological competencies (Schoenmakers and Duysters, 2006), and is a viable solution to the problem of resources and capabilities not always being available within a firm and difficult to obtain efficiently in the market (Das and Teng, 2000).

While most research on this topic focuses on the motives behind R&D collaboration (e.g., Fritsch and Lukas, 2001; Tether, 2002;

Miotti and Sachwald, 2003; Belderbos et al., 2004b), a number of authors have evaluated the impact of different types of collaborative networks on product innovation performance (Löf and Heshmati, 2002; Criscuolo and Haskel, 2003; Miotti and Sachwald, 2003; Belderbos et al., 2004a; Faems et al., 2005; Nieto and Santamaría, 2007). However, these studies present inconsistent results: some show that these relationships are negative or insignificant, while others find they are positive. This ambiguity implies that other factors may moderate the relationship between collaborative networks and product innovation performance. Given that inter-firm collaboration is an effective vehicle for organizational learning, prior research argues that a sufficient degree of absorptive capacity is required for effective learning in a collaborative agreement between firms (Mowery et al., 1996; Lane et al., 2001). Despite a growing interest in the link between organizational learning and product innovation (e.g., Adams et al., 1998; Erwin, 2002), relatively little research examines how absorptive capacity moderates the relationship between external linkages and product innovation. The lack of research on this issue is surprising, especially since some important works (e.g., Cohen and Levinthal, 1990; Kim, 1997, 2001; Teece, 2000) emphasize that a firm's absorptive capacity determines the extent to which it is able to utilize external knowledge.

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The present study therefore addresses the question: Do firms with a high level of absorptive capacity realize higher product innovation from close collaboration than firms with a low level of absorptive capacity? Answering this question can make a significant contribution to the literature on this topic. While previous studies focus on the effects of collaborative networks on product innovation performance, this paper proposes a contingency framework to address the value of absorptive capacity in explaining the relationship between collaborative networks and product innovation performance. Additionally, this study advances research on absorptive capacity by empirically examining its effect on the use of external knowledge for product innovation. Answers to the question of absorptive capacity are also important because they are relevant to firms that depend to a large extent on technology acquired from collaborating with different partners. In their efforts to reduce the costs and risk of technology development and to introduce higher-quality products faster than competitors, firms may count heavily on the effectiveness with which they can gain access to external sources of technological knowledge and skills. While some previous studies suggest that collaborating with different partners is an effective way to improve product innovation (e.g., Belderbos et al., 2004a; Nieto and Santamaría, 2007), this research sheds light on the importance of absorptive capability in the effectiveness of collaborative networks.

The remainder of this paper is organized as follows. Following this introduction, Section 2 reviews the literature and provides theoretical expectations. Section 3 introduces the research methods, including the model, variable definitions and measurements, and the data source utilized in this study. Section 4 presents the results and discussions. Section 5 summarizes the results, discusses their implications for theory and managerial practice, and suggests possible directions for future research.

## 2. Literature review and research hypotheses

### 2.1. The impact of different types of partners

Prior research suggests that a firm can advance its product innovation by interacting with different collaborators, primarily including suppliers, customers, competitors, and research organizations. Suppliers usually have greater expertise and more comprehensive knowledge regarding the parts and components which may be critical to a firm's new product development. Thus, supplier collaboration can allow firms to incorporate the expertise and different perspective of a supplier to improve its solutions or create new methods for product development (Bonaccorsi and Lipparini, 1994; Eisenhardt and Tabrizi, 1995). Supplier involvement also helps firms identify potential technical problems, thereby speeding up new product development and responses to market demands (Kessler and Chakrabarti, 1996). Miotti and Sachwald (2003) used the French CIS-2 survey to reveal the positive effect of collaboration with suppliers on the share of innovative product turnover. Faems et al. (2005) analyzed Belgian manufacturing firms and found a positive association between suppliers and the proportion of turnover attributed to improved products. In a survey of Spanish manufacturing firms, Nieto and Santamaría (2007) regressed product innovation on collaborative networks and found a positive link between collaboration with suppliers and the degree of product innovativeness. However, Sánchez and Pérez (2003) analyzed Spanish manufacturing firms and concluded that collaborating with suppliers does not improve new product performance. Freel (2003) analyzed UK small and medium-sized manufacturing firms and found that supplier collaboration does not have a significant impact on new product performance. Ledwith and Coughlan (2005) used a sample of electronics firms in Ireland and the UK and found an insignificant correlation between collaboration with sup-

pliers and product innovation performance. In addition, Belderbos et al. (2004a) studied Dutch manufacturing firms and found a negative but insignificant relationship between collaboration with suppliers and product innovation performance.

Collaborating with customers is another important way for a firm to improve its product innovation performance (Gupta et al., 2000; Fritsch and Lukas, 2001; Brockhoff, 2003). Working with customers not only provides benefits in identifying market opportunities for technology development, but also reduces the likelihood of poor design in the early stages of development. In addition, understanding the needs of influential customers may help firms gain new ideas about solutions (von Hippel et al., 1999) and identify market trends early on, thereby increasing the chances of new product development and success. Thus, customer involvement may lead to product innovation advantages (Souder et al., 1997; Li and Calantone, 1998). Miotti and Sachwald (2003), Freel (2003), and Faems et al. (2005) all found that collaboration with customers has a positive impact on product innovation performance. In contrast, Löf and Heshmati (2002) analyzed Swedish manufacturing firms and found a negative relationship between customer collaboration and product innovation performance. Nieto and Santamaría (2007) found that customer collaboration has a positive impact on product innovation with marginal changes, but does not affect significant innovation with new functions. In addition, Belderbos et al. (2004a) revealed an insignificant association between collaboration with customers and changes in new product sales. Monjon and Waelbroeck (2003) analyzed French manufacturing firms and found that customer collaboration has an insignificant impact on product innovation.

The least frequent type of collaborative network that firms adopt to achieve product innovation seems to be collaboration with competitors (Bayona et al., 2001; Nieto and Santamaría, 2007), but this type of collaboration still provides some advantages. Firms involved in a cooperative agreement may share technological knowledge and skills with each other, producing a synergistic effect on solving common problems outside the competitor's area of influence (Tether, 2002). The case study of Inkpen and Pien (2006) suggests that firms collaborating with competitors may perform better in innovation than they would otherwise. At the same time, firms can accelerate their capability development by R&D cooperation, which allows them to reduce the time and risk involved in technological innovation (Belderbos et al., 2004a). Furthermore, collaborating with competitors enables firms to ascertain their competitors' technological level; firms that are more knowledgeable about their competitors' technology strategies are better able to differentiate themselves (Linn, 1994). Löf and Heshmati (2002) found that collaborating with competitors is positively related to new product sales. However, Monjon and Waelbroeck (2003), Miotti and Sachwald (2003), and Belderbos et al. (2004a) found that competitor collaboration has a negative but insignificant impact on product innovation performance. Nieto and Santamaría (2007) also found that collaboration with competitors does not impact product innovation with marginal modifications, but it negatively affects product innovations with new functions.

Due to governments' encouragement, more and more firms are pursuing product innovations by collaborating with universities and research institutions. Universities and research institutes are important centers for the creation and dissemination of scientific knowledge (Hemmert, 2004). Firms can interact formally and informally with universities and research institutes to acquire new scientific knowledge to benefit their product or process innovations (Caloghirou et al., 2004). In contrast, a firm choosing not to acquire technological knowledge from universities and research institutions may fall behind, reducing the likelihood that it will make a technological breakthrough leading to a commercial product (Spencer, 2003). Several studies suggest that technological

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