# Strategic Suppliers' Technical Contributions to New Product Advantage: Substitution and Configuration Options

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## Abstract

Current theory lacks clarity on how different kinds of resources contribute to new product advantage, or how firms can combine different resources to achieve a new product advantage. While several studies have identified different firm-specific resources that influence new product advantage, comparatively little research has explored the contribution of strategic supplier resources. Combining resource-based and relational perspectives, this study develops a theoretical model investigating how a strategic supplier's technical capabilities impact focal firm new product advantage and how firms combine different resources to gain this advantage. The model is tested using detailed survey data collected from 153 inter-organizational NPD projects in the United Kingdom within which a strategic supplier had been extensively involved. Empirical results support our research hypotheses. First, supplier technical performance is shown to have a significant positive impact on new product advantage. Next, we show that while supplier technical capabilities have a positive influence on supplier technical performance, the *a priori* nature of the supplier's task moderates the relationship. Finally, our data supports our hypotheses related to the positive relationship between relationship-specific absorptive capacity and new product advantage, and the proposed negative moderation of supplier technical capabilities on this relationship. Based upon these findings, we encourage managers to recognize that strategic suppliers' with greater technical capabilities perform better regardless of the degree of creativity required by their task; but that strategic suppliers with lower technical capabilities may partially compensate (substitute) for their lack of technical capabilities, if they are able to respond to high problem-solving task requirements. Furthermore, we suggest that the firm's development of relationship-specific absorptive capacity is much more important when a strategic supplier is less technically capable. A buying firm's relationship-specific absorptive capacity can, according to our data, substitute for low supplier technical capabilities. On the other hand, where the supplier has strong technical capabilities investments in relationship-specific absorptive capacity have no effect on new product advantage. Our findings reinforce recent calls for research on how firms can combine different resources and capabilities to achieve superior performance.

## Introduction

As firms increasingly invest in new product development (NPD), greater attention is being given to building a new product's advantage in the market. Managers often find that while their new products meet internal project goals, technical objectives, budget costs and development schedules, they fail when launched in the market because they do not offer superior product performance, relative to competitor offerings. Consequently, the ability of managers to ensure that their new products incorporate the latest technologies that surpass competitors' products is critical to success (McNally, Cavusgil and Calantone, 2010). Capturing a new product advantage is thus an important strategic objective for many firms within highly competitive industries (Atuahene-Gima and Wei, 2011; Droge, Calantone and Harmancioglu, 2008; Rijsdijk, Langerak and Hultink, 2011). It is a critical determinant of the success of a NPD project, and has been defined as the ability of the new product to offer unique features, meet customer needs, offer higher quality, and provide superior technical performance in comparison to its competitors' products (Song and Parry, 1997).

The product innovation literature has identified key firm-specific capabilities, such as market orientation, development speed, market learning and product innovativeness that play an important role in determining new product advantage (Atuahene-Gima and Wei, 2011; Kim and Atuahene-Gima, 2010; Langerak and Hultink, 2005). Comparatively few studies, however, have examined the role of inter-organizational NPD and the contribution of strategic suppliers to new product advantage (Lau, Yam and Tang, 2011; Wynstra, von Corswant and Wetzels, 2010). More specifically, research, to our knowledge, has not considered how firms configure their resources and those of their strategic suppliers to gain a new product advantage, or how different resource configurations allow firms to substitute one resource for another (Gruber, Heinemann,

Brettel and Hungeling, 2010; Hess and Rothaermel, 2011; Sirmon, Hitt and Ireland, 2007; Tzabbar, Aharonson and Amburgey, 2013). Given the increasing prevalence of inter-organizational NPD projects, this represents a key gap in the literature.

Building on the product innovation, strategic management and supply chain literature, we propose that firms that integrate strategic suppliers into their NPD projects are likely to gain a new product advantage by accessing and leveraging their supplier's technical capabilities, as well as innovations that have yet to be integrated into competitor products (Petersen, Handfield and Ragatz, 2005; Song, Song and Benedetto, 2011; Wagner, 2012). Furthermore, we posit that firms can use different configurations of supplier-specific and firm-specific resources to obtain new product advantage (Gruber et al., 2010; Hess and Rothaermel, 2011; Sirmon et al., 2007). More specifically, we seek to answer three research questions: In technology intensive dynamic industries, how do strategic suppliers' technical capabilities contribute to supplier technical performance and new product advantage? Is this contribution moderated by the problem-solving requirements of the supplier's product development task? Do strategic supplier technical capabilities moderate the relationship between the firm's relationship-specific absorptive capacity and new product advantage?

Resource-based and relational perspectives are adopted to propose different configurations of strategic supplier and firm resources, which can be used to gain new product advantage and sustain their product's competitive position within the market (Barney, 1991; Dierickx and Cool, 1989; Reed and DeFillippi, 1990). We empirically assess our hypotheses using detailed survey data collected from 153 inter-organizational NPD projects in the United Kingdom within which a strategic supplier had been extensively involved. The data provides

support for each of our hypotheses, suggesting that different configurations of firm-specific and strategic supplier-specific resources contribute to new product advantage.

This study makes two important contributions to the product innovation management literature. First, we extend the literature by examining how strategic suppliers' technical capabilities affect the development of new product advantage in inter-organizational NPD projects. In particular, we find that not only do supplier technical capabilities positively affect supplier technical performance, which in turn positively affects new product advantage, but these resources can also substitute for buyer relationship-specific absorptive capacity. Our results provide a nuance to the literature on absorptive capacity highlighting its importance where supplier technical capabilities are low and the firm must invest in relationship-specific absorptive capacity in order to extract useful technology and innovation. Second, we reveal how the problem-solving requirements of the supplier's task moderates the effect of supplier technical capabilities on supplier technical performance. Although problem-solving task requirement has minimal moderating effect on the relationship between strategic suppliers with high technical capabilities and supplier technical performance, the impact of low supplier technical capabilities on supplier technical performance varies significantly under high and low problem-solving task conditions. It would appear in our sample that some suppliers with lower technical capabilities have developed problem-solving capabilities that allow them to compensate somewhat for their constrained technical capabilities in order to increase their overall technical performance. We thus also contribute to the literature on resource constraints in product development settings (Gibbert, Hoegl and Valikangas, 2013).

In the pages below, we begin by providing a brief overview of the relevant literatures and, then, develop our specific hypotheses. Next, we report our methodology and empirical

findings. We conclude with a discussion of the study's implications, limitations and future directions.

## Theory and Hypothesis Development

### *New Product Advantage*

Early studies by Cooper (1977) identified a significant positive relationship between the level of new product success and measures of product competitive advantage, such as the presence of unique features, relatively high product quality, and the ability to reduce consumer costs. More recently, studies have continued to find significant relationships between new product advantage and several measures of product success, including objective measures of financial performance (Hua and Wemmerlöv, 2006; McNally et al., 2010; Song and Parry, 1997; Song and Parry, 1996; Song, Souder and Dyer, 1997). Thus, *new product advantage* is defined as "a product's perceived superiority to competitive products" (Song and Montoya-Weiss, 2001) and is concerned with the product's technical performance and quality, and the degree to which it meets customer's needs with unique features and capabilities (Song et al., 1997). While the product innovation literature has studied new product advantage extensively, it has seldom been considered in relation to strategic supplier involvement in NPD projects.

### *Resource-based and Relational Views of Resource Development*

According to the Resource-Based View of the firm, advantage accrues from heterogeneous and immobile resources that have accumulated over time (Collis, 1994; Dierickx and Cool, 1989; Wernerfelt, 1984). More specifically, Barney (1991: 116) argues that the "source of sustained competitive advantage are firm resources that are valuable, rare, imperfectly imitable, and non-substitutable". Resources with these characteristics cannot easily be imitated due to causal

ambiguity and resource scarcity (Kogut and Kulatilaka, 2001). This perspective defines resources as physical and intangible resources and the organizational capabilities to manage those resources, and posits that capabilities are typically harder to imitate than other resources, because of their complexity and ambiguity (Barney, 1991). The path dependent nature of firm resources are recognized, but it is acknowledged that firms with greater resources will enjoy greater "appropriability advantages" and enhanced flexibility with which to respond in turbulent, dynamic environments (Kraatz and Zajac, 2001; Nelson and Winter, 1982).

The resource-based view, and the competence perspective more broadly defined, recognize not only the potential for firm-specific resources to provide a competitive advantage, but also acknowledge that firms access and leverage alliance partners' resources to maintain and continuously renew, augment, and adapt their resources to gain and retain a competitive advantage (Helfat and Peteraf, 2003; Mesquita, Anand and Brush, 2008). Moreover, this perspective recognizes that in dynamic environments firms use dynamic capabilities - organizational processes by which members manipulate resources to develop new value-creating strategies (Eisenhardt and Martin, 2000; Teece, Pisano and Shuen, 1997) - to blend modular existing and new resources into new resource combinations or apply simple rules to improvise with loosely coupled resources to shift from leveraging existing resources to seize opportunities using novel combinations of new and existing resources (Davis and Eisenhardt, 2011; Davis, Eisenhardt and Bingham, 2009; Santos and Eisenhardt, 2005). Thus, the resource-based or competence perspective posits that at any given point in time a firm's capability portfolio and that of their strategic suppliers, reflect their co-evolution of resources with environmental opportunities (Laamanen and Wallin, 2009; Volberda and Lewin, 2003).

The relational view of the firm emphasizes how firms sense, seize, and transform resources sourced from strategic suppliers to earn relational rents and develop competitive advantage using mechanisms such as supplier selection and development processes, investments in relationship-specific assets, appropriate governance mechanisms, and inter-firm routines for communication, information sharing, mutual planning, and problem solving (e.g. Dyer, Kale and Singh, 2001; Dyer and Singh, 1998). We define *strategic suppliers* as important suppliers that firms have made a long term commitment to, due to their strategic inputs – inputs that are typically high value-added and play a role in differentiating the firm's final product, and have developed a relationship with in order to leverage strategic and operational capabilities of the individual companies to achieve ongoing benefits to each party (Dyer, Cho and Chu, 1998; Monczka, Petersen, Handfield and Ragatz, 1998). These relationships are characterized by a high degree of coordination at multiple functional-to-function interfaces, relation-specific asset investments, and inter-firm knowledge-sharing routines (Dyer et al., 1998; Dyer and Hatch, 2006; Dyer and Nobeoka, 2000). Furthermore, strategic suppliers are typically involved early and extensively in new product development, allowing the firm to access suppliers' skills, creativity, and technology (Clark, 1989; Handfield, Ragatz, Petersen and Monczka, 1999; Lau, Tang and Yam, 2010; Petersen, Handfield and Ragatz, 2003). While the relational view has long recognized that complementary resources are a major driver for relational rents and competitive advantage in individual alliances (Dyer and Singh, 1998), research has only begun to consider how new product development process characteristics can moderate the relationship between resources and product innovation (Fang, 2011) and how firm and supplier resource combinations can substitute for one another in NPD (Hess and Rothaermel, 2011; Weigelt, 2013).

## Theoretical Framework and Hypotheses Development

Combining the resource-based and relational perspectives we explore how strategic suppliers' technical capabilities help firms generate new product advantage (Azadegan and Dooley, 2010; Wagner, 2012). More specifically, we investigate how the supplier's technical capabilities influence their technical performance, which in turn affects the firm's new product advantage (see Figure 1). We also consider how the relationship between supplier's technical capabilities and their technical performance is moderated by the creative problem-solving requirements of their task (Atuahene-Gima and Wei, 2011). Finally, we assess the relationship between firm's relationship-specific absorptive capacity and their new product advantage, and the moderating effect of the strategic supplier's technical capabilities on this relationship (Ettlie and Pavlou, 2006).

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Insert Figure 1 about Here
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*Supplier Technical Performance, Supplier Technical Capabilities and New Product Advantage*

The involvement of strategic suppliers in new product development processes is of increasing strategic importance, with firms relying on these suppliers to deliver or further develop technologies for their NPD efforts (Ragatz, Handfield and Scannell, 1997; Song et al., 2011). Such suppliers are able to perform multiple tasks that assist firms struggling to understand or develop new technology that surpasses their competitors' technologies (Clark, 1989; Handfield et al., 1999; Lau et al., 2010; Petersen et al., 2003). Strategic suppliers' strong technical performance contributes advanced technical knowledge, new technology advancements, and creative problem solving (e.g. Rauniar, Doll, Rawskic and Hong, 2008; Wasti and Liker, 1997; Womack, Jones and Roos, 1990), which assists firms in establishing new product advantage.

Finally, strategic suppliers can also provide buyers with market intelligence on the capabilities of their competitors, helping them benchmark performance and ensure that their technical capabilities are superior (Handfield, 2006). These arguments lead us to hypothesize that increases in strategic supplier technical performance will result in improved new product advantage.

*Hypothesis 1: The greater the strategic supplier's technical performance, the greater the firm's new product advantage relative to competitors' products.*

Consistent with the resource-based view, firms are expected to recognize a strategic supplier's unique technical capabilities, which can be leveraged in NPD-related activities (Emden, Calantone and Droge, 2006). Supplier's technical competence helps to practically develop the product by testing and evaluating its technical specifications (Pavlou and El Sawy, 2006). Van Echtelt et al (2007: 182) emphasize the importance of supplier technical capabilities in their definition of supplier involvement as "the resources (capabilities, investments, information, knowledge, ideas) that suppliers provide, the tasks they carry out and the responsibilities they assume regarding the development of a part, process, or service for the benefit of a buyer's current or future product development project." Thus, supplier's technical capabilities can be defined as the extent to which "a supplier has the resources to create and respond to emerging technologies" (LaBahn and Krapfel, 2000: 177). Womack, Jones, and Roos (1990) observed that a supplier's stock of technical know-how is one of their primary means of competing, and Håkansson (1982) argued that sophisticated component suppliers compete by leveraging their technical knowledge in order to pursue relationships in which they can profitably apply and refine their expertise. Furthermore, firms who involve strategic suppliers early in NPD design work are better able to capitalize on their in-house technical capabilities and capabilities (Wasti and Liker, 1997) and reduce development delays (Hartley, Zirger and

Kamath, 1997). Finally, strategic suppliers with developed technical capabilities help to reduce the prevalence of costly design glitches and technical errors for the focal firm (Rauniar et al., 2008). Based on these findings, we propose that as a strategic supplier's technical capabilities increase, their technical performance will increase.

> *Hypothesis 2a: The greater the strategic supplier's technical capabilities, the greater the supplier's technical performance.*

Both the resource-based and relational perspectives recognize the importance of firms and their suppliers developing independent as well as joint problem-solving capabilities. Research by Clark (1989) and Clark and Fujimoto (1991) identified a key benefit of strategic supplier involvement as its ability to create overlapping and integrated problem solving cycles that span the buyer-supplier interface. Takeishi (2001) found that a higher level of focal firm internal coordination affected component development indirectly through problem solving patterns established with external suppliers. Furthermore, Bstieler and Hemmert (2010) showed that shared problem solving plays a crucial role in helping to solve technical problems and design defects that frequently occur during the early stages of new product development. Moreover, Atuahene-Gima and Wei (2011) suggested that problem-solving speed and problem solving creativity are key determinants of product quality and new product advantage. Finally, Fang (2011) found that NPD process characteristics associated with joint problem-solving moderate the relationship between alliance partner knowledge complementarity and product innovation.

This literature suggests that the more creative problem solving required by strategic suppliers to perform their requisite tasks, the less impact their technical capabilities will have on their technical performance as assessed by the buying firm. We suggest two reasons creative

problem solving task requirements will attenuate (negatively moderate) the impact of technical capabilities on strategic suppliers' performance. First, as problem solving requirements increase, suppliers' technical capabilities become less directly related to their technical performance, due to increased process interdependence, complexity, and causal ambiguity (Barney, 1991; Fang, 2011; Kogut and Kulatilaka, 2001). As supplier tasks become more interdependent, complex, and ambiguous, buyers assessing supplier performance will be less able to specify how suppliers' technical capabilities directly impacted their technical performance. Second, buying firms may consider the problem-solving requirements of the supplier's task simply part of the job, a responsibility of the strategic supplier, and, thus, only assess the final performance - unconcerned with how the strategic supplier performed the task. After all, research on buyer-supplier exchanges found that while suppliers considered joint sense-making a significant predictor of relationship performance, buyers did not (Cheung, Myers and Mentzer, 2011). Thus, it is anticipated that the level of creative problem solving required to accomplish the NPD tasks assigned to strategic suppliers will moderate the impact of their technical capabilities on their technical performance.

> *Hypothesis 2b: The level of creative problem solving required by the supplier's NPD task moderates the relationship between the supplier's technical capabilities and their technical performance.*

*Relationship-specific Absorptive Capacity and New Product Advantage*

The resource-based and relational perspectives agree that firms are motivated to develop their ability to absorb and integrate technical knowledge from their strategic suppliers in order to sense, seize, and transform new technical knowledge required to gain and retain new product advantage (Gulati, 1995). This is most likely when strategic suppliers have distinct yet complementary technical capabilities, when partners through collaboration may gain access to

new technology or innovations, or the firm may gain access to a new market while the supplier has the opportunity to become a value-added supplier (Dyer and Singh, 1998; Emden et al., 2006). Evidence also suggests that the presence of overlapping knowledge is a necessary condition for firms to absorb the technical knowledge developed by their strategic suppliers (Tanriverdi and Venkatraman, 2005), because if there is insufficient knowledge overlap firms will be unable to realize the technology's potential, discover the complementarities of their resources, and communicate these complementary resources inter-organizationally (Emden et al., 2006). For example, Takeishi (2001) found that a NPD project in which an automaker's engineers had a higher level of knowledge about an outsourced component exhibited a higher level of component design quality. In a similar vein, Brusoni, Prencipe and Pavitt (2001) showed that focal firms need to have knowledge, in excess of what they need for what they make, to cope with and adapt to imbalances caused by uneven rates of development in the technologies they rely on. Furthermore, research evaluating cooperative strategies has emphasized the importance of developing partner-specific knowledge sharing routines with strategic suppliers in order to absorb technical knowledge to gain a competitive advantage (Dyer, 1996; Dyer and Singh, 1998). Finally, the resource-based perspectives suggests that firms may need to integrate strategic suppliers' technology with their own internal technical capabilities after they absorb it, if they hope to create new product advantage (Abecassis-Moedas and Mahmoud-Jouini, 2008). Thus, both the resource-based and relational research suggests the following hypothesis:

> *Hypothesis 3a: The greater the firm's relationship-specific absorptive capacity, the greater the new product advantage achieved relative to competitors' products.*

However, the impact of the focal firm's relationship-specific absorptive capacity on new product advantage can be expected to vary based on the level of the strategic supplier's

technical capabilities for at least two reasons. First, strategic alliance research looking at different resource combinations effects on innovative performance has found that resource combinations that focus on the same upstream value chain activities provide redundant knowledge and are substitutes (Hess and Rothaermel, 2011). Resources are substitutes for one another if doing more of an activity to leverage a resource reduces the marginal benefit of another (Arora and Ceccagnoli, 2006; Cassiman and Veugelers, 2006). Firms may determine that the degree of interaction required to absorb strategic suppliers' strong technical capabilities increases coordination costs and increases the chance of unintended technology leakage (Contractor, Woodley and Piepenbrink, 2011), and, thus, forgo these costs by outsourcing technical capabilities from strong strategic partners. For example, strategic suppliers with strong technical capabilities will often be developing new 'sticky' knowledge that firms will find difficult to access and costly to transfer across inter-organizational boundaries, even when they seek to develop relationship-specific absorptive capabilities (von Hippel, 1994). Furthermore, when strategic supplier's technical capabilities are considered their core competencies, it will become increasingly difficult and costly for firms to absorb strategic suppliers' technical knowledge because of the supplier's fear of opportunism and loss of bargaining power (Simonin, 1999).

Second, research that compares resource-based and relational perspectives to examine competitive advantages in vertical relationships has found that the resource-based view helps to explain performance gains if the new capabilities lie entirely within the suppliers' boundaries, while the relational view reveals the gains that are exclusive to the learning partnership (Mesquita et al., 2008). Consistent with a resource-based perspective, strategic suppliers that have developed strong technical capabilities through specialization can further enhance their

resources by applying and deploying them across a number of buyers (Mesquita et al., 2008). Although this will not constitute a unique application to the buyer, the strategic suppliers' technical capabilities will still be valuable because they reflect industry best practices (Weigelt, 2013). Outsourcing strong technical capabilities from a strategic supplier may be particularly beneficial for a technically weak buyer, as industry best practices have a greater relative advantage for weaker buyers than for stronger buyers (Jacobides and Winter, 2005).

On the other hand, the relational view recognizes the performance gains exclusive to the learning relationship as a function of the focal firms acquiring know-how within the dyad and developing relationship-specific capabilities with a strategic supplier (Mesquita et al., 2008). A higher degree of interaction and the associated increase in coordination costs may be worthwhile, if the strategic supplier has a lower level of technical expertise (Contractor et al., 2011). Under these conditions the technically weaker strategic supplier will be less fearful of opportunism and loss of bargaining power (Simonin, 1999), or the chance of unintended technology leakage (von Hippel, 1994). Furthermore, the firm will need overlapping knowledge to absorb the technical knowledge developed by their strategic suppliers in order to realize the technology's potential, discover the complementarities of their resources, and communicate these complementary resources inter-organizationally (Emden et al., 2006; Tanriverdi and Venkatraman, 2005). Finally, the firm will need to be more capable of evaluating the quality of the supplier's technical capabilities, and absorbing and integrating these resources, because they will be less willing to be dependent on a technically weak strategic supplier to perform the task alone. These pressures are likely to require the firm to invest in additional absorptive capacity to extract strategic supplier's technical capabilities in aid of building a new product advantage.

*Hypothesis 3b: The strategic supplier's technical capabilities moderate the relationship between the firm's relationship-specific absorptive capacity and the new product advantage achieved relative to competitors' products.*

## Method

*Sample Characteristics*

A sample of 1700 medium-to-large manufacturing firms was drawn from databases held by Department of Trade and Industry (UK) and other publicly available sources based on their UK Standard Industrial Classification (SIC) codes, the contact persons job function (purchasing manager or equivalent), and plant size (at least 100 employees). To ensure that the firms met our selection criteria, telephone calls were made to each of the manufacturing firms prior to distribution of the survey. This preliminary screening confirmed the difficulties in identifying the most knowledgeable information in relation to a strategic supplier's role in a new product development project. Often several referrals within a firm occurred before we were able to identify the single most knowledgeable respondent. After data screening, 204 firms did not meet the selection criteria for our research and were removed, resulting in a final sample of 1496 firms. Ultimately, 160 questionnaires were received, of which seven were unusable due to missing data. The effective response rate is thus 10.3% (153/1496). Further details of the sample can be found in Table 1.

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Of the responding firms, industries represented were automotive (8.5%), aerospace (14.4%), pharmaceutical (10.4%), electrical (35.3%), chemicals (11.8%), and general manufacturing (11.1%). The final eleven percent of firms had no response to industry

classification. The response by position held within the firm was Operations Manager (19.6%), R&D Manager (17.0%), Purchasing Manager (38.5%), and Procurement Director (15.6%). No significant mean differences were detected between these groups, or across functional departments. The average number of years respondents had worked with the firm was 9.2 years, with 3.2 years in their current job position, providing support that our informants were also knowledgeable about their firm's capabilities.

*Survey Administration*

The unit of analysis was an inter-organizational NPD project. Respondents were instructed to select a supplier that had been extensively involved in an inter-organizational NPD project within the last three years and had provided a critical component or sub-assembly to the buyer firm's end product. Given our use of a single key informant, we undertook an additional validation check, asking respondents their level of knowledge of the supplier relationship and NPD project, using a Likert scale of 1-7, where 7 represented "extensive knowledge" (Kumar, Stern and Anderson, 1993). A mean response of 5.8 (out of 7) provides confidence that respondents were knowledgeable regarding the items under investigation.

Semi-structured interviews to develop and refine the questionnaire were conducted initially with ten managers across the purchasing, project management and product design functions. The instrument was then pilot tested with a further 10 managers and six academic experts who provided further feedback on the design, content, clarify and scaling. Each respondent was sent a copy of the questionnaire by mail, together with a cover letter outlining the purpose of the research project. To elicit responses, a number of procedures outlined by Dillman (2000) were adopted, including allowing responses by return mail or internet, offering a

composite summary of results and sending a reminder postcard two weeks after the initial mailing. After six weeks, a follow-up call to non-responders was also made. Tests were also undertaken to detect response biases, such as between early and late responders (Armstrong and Overton, 1977). No significant differences were identified. Further representative checks were also made using Pearson's chi-square tests to identify if there was any over or under representation of particular types of firms in our sample (Greene, 2002). Although our analysis does not rule out the potential for response bias, the findings identify that the sample is broadly representative.

*Operationalization of variables*

All constructs were previously validated and drawn from the extant literature. Items were assessed on a Likert scale ranging from 1 "strongly disagree", to 7 "strongly agree". Table 2 provides further details of these measures.

*New product advantage:* A scale originally validated by Song and Parry (1997) is adopted, with respondents asked to assess their firm's new product compared to those of competitors' products in terms of unique features, technical performance, quality, enabling customers' to do something they could not presently do, and meeting customers' needs.

*Supplier technical performance*: Following Carson (2007), we examine a strategic supplier's content contributions to *ex post* performance, namely their contribution to technology. The contribution of supplier's technology construct asked respondents to characterize the supplier's technology contribution to the NPD project in terms of its anticipated effect on competitiveness, functionality, and profitability of the new product.

*Supplier technical capabilities*: A scale originally developed by LaBahn and Krapfel (2000) was used to assess the extent to which the supplier could incorporate the latest technology in their products, was proficient with the latest technology, was skilled at creating technological innovations, was able to respond quickly to technological changes and could offer a high degree of engineering support.

*Creative problem-solving task requirements:* A scale originally developed by Andrews and Smith (1996) and adapted by Carson (2007) was used to measure the *a priori* level of creative problem-solving required by the supplier in order to perform their work successfully. Since the extent of problem solving required is idiosyncratic to the supplier, the items capture the strategic supplier's characteristics in terms of their *a priori* required process innovativeness, creativity and imagination for the project.

*Relationship-specific absorptive capacity*: Ettlie and Pavlou's (2006) measure was used to capture the degree of relative absorptive capacity. This measure focuses on the integration of firm-specific and supplier-specific knowledge pools, the exploitation of the supplier's knowledge, the routines used to obtain the supplier's technological knowledge, and the firm's ability to identify, value, and import knowledge from the particular supplier.

*Control variables:* A series of control variables were also used within the multivariate OLS regression models. Industry effects were controlled for using three dummy variables for the automotive industry, aerospace industry and electronics industry. The hold out sample was categorized as other. We control for firm size (log of employees). To reflect the nature of the supplier relationship, we controlled for relationship length (log of months) (Wasti and Liker, 1997), long-term relationship commitment (Paulraj, Lado and Chen, 2008), evaluation effort in the supplier selection process (Song and Di Benedetto, 2008) and supplier criticality (measured

by a single sourcing strategy) (Richardson and Roumasset, 1995). The contribution of the supplier to the project was also accounted for by item importance, coded as 1 or 0, capturing whether the supplier provided a sub-assembly to the firm (Liker, Kamath, Wasti and Nagamachi, 1996), as well as supplier responsibility, reflecting the percent of total engineering hours for the new product attributable to the supplier (Clark and Fujimoto, 1991; Liker et al., 1996). The advantage gained by the new product in the market may be influenced by its degree of underlying technological innovation, thus we control for the degree of technological newness on a 1-4 scale (Takeishi, 2001).

**Data Analysis**

Confirmatory Factor Analysis (CFA) was used to test for construct validity and unidimensionality using latent and manifest variables. Within each construct, one of the loadings was fixed to the value of one. Low factor loadings, high residual values, and modification indices were examined. One item from supplier creative problem-solving task requirements was removed due to low loadings. Table 2 presents the details of the loadings and error terms of the manifest variables onto each latent variable. Model fit was examined using four measures: the chi-square test, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root-mean-square error of approximation index (RMSEA) (Gerbing and Anderson, 1992). The fit of the CFA to the data was satisfactory [$\chi_2(383)=645.96$, $p=0.00$; CFI = 0.91; TLI = 0.90; and RMSEA = 0.067].

A number of procedures were then followed to assess convergent validity (Bagozzi and Yi, 1988) and discriminant validity (Anderson and Gerbing, 1988; Fornell and Larcker, 1981). The convergent validity of the scales (extent to which the measurement items reflect a common

underlying construct) was supported, with estimated coefficients of all indicators being significant ($t > 2.0$). The average variance extracted (AVE), which measures the variance captured by the indicators relative to measurement error, was also greater than the 0.50 minimum necessary to justify the use of a construct (Hair et al. 2006). Composite reliability values also provide a further assessment of internal consistency. A minimum value of 0.70 is recommended as it indicates that around 0.50 of the variance (the squared loading) can be attributed to the construct of interest (Fornell and Larcker, 1981). The composite reliabilities, which ranged from .78 to .92, each met the required level.

All tests of discriminant validity were supportive. That is, no confidence intervals of the correlations for the constructs ($\phi$ values) included 1.0 ($p < .05$) (Anderson and Gerbing, 1988), and the square of the intercorrelations between two constructs, $\phi 2$, was less than the AVE estimates of the two constructs. This was true for all pairs of constructs (Fornell and Larcker, 1981). Inter-item correlations, Cronbach's alpha, composite reliabilities (CR), and average variance extracted (AVE) values are shown in Table 3.

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Insert Table 2 Here

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Multivariate OLS regression models were then used to test each of the hypothesized relationships within the theoretical model. Variance inflation factors (VIF) were also examined to test for multicollinearity. All VIFs ranged from 1.13 to 1.84, therefore it is reasonable to conclude that the data set is clear of any multicollinearity issues (Hair, Black, Babin, Anderson and Tatham, 2006).

**Results**

The results shown in Table 4 provide support for the hypothesized relationships within the theoretical model. A significant positive relationship for strategic supplier technical performance to new product advantage (β= .20, p<.05), provides support for H1. Consistent with expectations, H2 was supported with a significant positive association between supplier technical capabilities and strategic supplier technical performance (β= .40, p<.001) (H2a), negatively moderated by supplier problem-solving capability (β= -.11, p<.05) (H2b). H3 was supported with a positive association between relationship-specific absorptive capacity and new product advantage (β= .14, p<.05) (H3a), moderated by supplier technical capabilities (β= -.15, p<.01) (H3b).

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Insert Table 4 Here
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To further understand these interaction effects, we recalculated the regression equations at high and low values for each moderator. We define high and low values as plus and minus one standard deviation from the mean (Cohen and Cohen, 1983). With respect to H2b, Figure 2 shows that high levels of creative problem-solving requirements attenuate (negatively moderate) the relationship between strategic supplier technical capabilities and supplier technical performance, supported by a significant simple slope calculation (t=6.20, p=.00), while low levels of creative problem-solving requirement had a marginal effect (t=1.79; p=.08). With respect to H3b, Figure 3 indicates that where a supplier has low levels of technical capabilities, focal firm relationship-specific absorptive capacity has a positive and significant effect on new product advantage. However, where a supplier has high level of technical capabilities, the effect of relationship-specific absorptive capacity on new product advantage remains virtually

unaffected. This is supported by simple slope computations showing that low levels of supplier technical capabilities was significant (t=4.71, p=.00), while high levels of supplier technical capabilities were non-significant (t=-.09, p=.92).

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Insert Figure 2 Here

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Insert Figure 3 Here

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With respect to the control variables, significant associations were found to new product advantage from item importance (β= .18, p<.05), technological newness (β= .29, p<.001), relationship length (β= .21, p<.01), and evaluation effort (β= .27, p<.001). Furthermore, long term-relationship commitment was also found to be associated with both supplier technical performance (β= .20, p<.05) and new product advantage (β= -.19, p<.05).

**Discussion**

In this study we investigated how firms configure their resources, and those of their strategic suppliers, to gain a new product advantage, and how different resources can substitute for one another. While product and process technology define the technical aspects of NPD and the types of specialized knowledge required, the division of tasks between firms and their suppliers remains the domain of buying firms as they mindfully improvise heterogeneous NPD processes (Grant, 1996; Laamanen and Wallin, 2009; Salvato, 2009). Research cautions against drawing universalistic normative implications about firm choices regarding when to internalize or outsource value-chain activities (Leiblein, Reuer and Dalsace, 2002), and recognizes that different configurations of resources are equally effective in contributing to technical innovation

(Gruber et al., 2010; Sirmon et al., 2007; Tzabbar et al., 2013). We now discuss each of our results in turn, below.

Hypothesis H1 argued that the extent of new product advantage gained in the market was, at least in part, dependent on the technical performance of the strategic supplier. Our results support this view, showing that supplier technical performance, in terms of their contribution to the competitiveness, functionality and profitability of the end product helps to generate a new product advantage. This finding supports the resource and relational perspectives by demonstrating how the joint development of new products, and the integration of suppliers' technical contributions, helps to build a new product's advantage relative to competitors' product offerings (Dyer and Singh, 1998; Lau et al., 2010).

Consistent with expectations, we find support for H2a that the quality of the technical capabilities possessed by a strategic supplier drives subsequent technical performance. This finding supports the resource based view, showing that the unique technical capabilities possessed by strategic suppliers, when successfully integrated and exploited within the inter-organizational NPD project, can enhance the functionality and competitiveness of the new product when it is launched into the market (Emden et al., 2006).

Hypothesis H2b examined whether the extent of *a priori* creative problem-solving required by the supplier task moderated the relationship between supplier technical capabilities and technical performance. The results supported this hypothesis. Under conditions where the supplier's task required only low levels of creative problem-solving to be considered a success, increasing levels of supplier technical capabilities led to significantly higher technical performance. In effect, increased technological competence by the supplier could be directly applied to the required product development. By contrast, where the nature of the supplier task

required high levels of creative problem-solving, the associated increase in uncertainty, complexity and ambiguity (Fang, 2011; Kogut and Kulatilaka, 2001) makes the existing stock of supplier technical capabilities less effective at contributing to the supplier's technical performance. In such situations, buyers are also less likely to be able to apply their own domain expertise to monitor and instruct the supplier on achieving the project goals (Carson, 2007).

While several studies have examined the effect of absorptive capacity on NPD outcomes (e.g. Tsai, 2009; Vega-Jurado, Gutiérrez-Gracia, Fernández-de-Lucio and Manjarrés-Henríquez, 2008; Zahra and George, 2002), few have examined relationship-specific absorptive capacity that relates to a single strategic supplier (Ettlie and Pavlou, 2006). Our findings provide strong support for H3a that investments in developing relationship-specific absorptive capacity with respect to the strategic supplier lead to improved new product advantage. For strategic suppliers involved in product development activities developing absorptive capacity tailored to the dyad is one of the ways in which inter-organizational NPD projects can develop a new product advantage. This finding supports earlier studies by Tanriverdi and Venkatram (2005) which found that overlapping knowledge and absorptive capacity are necessary factors that facilitate the absorption of technical knowledge from strategic suppliers (Abecassis-Moedas and Mahmoud-Jouini, 2008; Emden et al., 2006).

Finally, our findings provide support for H3b that a strategic supplier's technical capabilities would moderate the relationship between relationship-specific absorptive capacity and new product advantage. As shown in Figure 3, in situations where strategic suppliers have low levels of technical capabilities, relationship-specific absorptive capacity serves a substitution role, enabling the firm to extract relevant ideas, technologies and innovations from the supplier to facilitate new product advantage. Several explanations for these results are apparent. From a

relational view perspective (Dyer and Singh, 1998; Mesquita et al., 2008), the performance gains from such investments in developing relationship-specific capabilities with a strategic supplier are held within the buyer-supplier dyad. Thus, where the supplier has low technical capabilities, incurring higher interaction and coordination costs may be worthwhile in order to extract and absorb the supplier's know-how (Contractor et al., 2011) to generate a new product advantage. It may also be the case that suppliers with low technical capabilities incur internal resource constraints that limit their ability to develop and transfer their technical knowledge across inter-firm boundaries (Gibbert et al., 2013). To overcome this problem, firms have to invest in relationship-specific absorptive capacity to successfully identify and absorb the creative know-how developed by their resource-constrained strategic supplier.

By contrast, where suppliers possess strong technical capabilities, investments in relationship-specific absorptive capacity were found to have no significant effect on the level of new product advantage achieved. One explanation is that suppliers possessing advanced technical capabilities are capable of independently fulfilling the requirements of their engagement, with their capabilities subject to a tight appropriability regime (Hurmelinna-Laukkanen, Sainio and Jauhiainen, 2008). Indeed, this is consistent with a resource-based perspective, where the origins of superior performance lie within the supplier's boundaries, and remain inimitable to the firm despite investment in absorptive capacity (Dierickx and Cool, 1989). While the supplier can still deploy their resource across multiple buyers (Mesquita et al., 2008), the supplier's contribution remains a source of competitive parity, or even advantage, as they reflect industry best practices (Weigelt, 2013).

*Managerial Implications*

These results offer several key implications for managers. Our findings provide further support for the benefits of involving strategic suppliers in the new product development process. The division of tasks between the firm and its suppliers within this process is a constant managerial challenge, and our study sheds light on the different configurations of firms and supplier resources which contribute to a product's advantage in the market. In particular, our study helps managers better direct the allocation of scarce resources within the portfolio of suppliers involved in the new product development project. For example, investing in absorptive capacity unique to the dyad is shown to be worthwhile only where the supplier possesses low technical capabilities, in which situation absorptive capacity can help extract relevant technology from the supplier and deploy it into the firm's end product. By contrast, the appropriability regimes maintained by highly technologically capable suppliers prohibit the transfer of knowledge and technology, with relationship-specific absorptive capacity unlikely to be a source of exclusive advantage for the firm.

Further, improvements in a strategic supplier's technological contribution could be achieved by considering the degree of creativity and problem-solving required for them to perform their task successfully. The same design task may present a different level of challenge to different suppliers, so management must tailor their monitoring and interventions to reflect the nature of the task and its match with the supplier's technical capabilities. Where the supplier's task is incremental in nature, and therefore little uncertainty and ambiguity about what is required, the supplier's existing technical capabilities remain useful. Management's span of attention could be preserved by monitoring the supplier's work based on output measures and by exception. In contrast, where the task requires a highly creative solution, then investment in joint

problem-solving and coordination routines, along with process monitoring of *how* the supplier is carrying out the task is more appropriate.

*Limitations and Future Directions*

A number of limitations are present in the current study. First, the hypotheses domain and data collection is restricted to industries where the technological environment is dynamic, perceived uncertainty is high, and a resulting high need exists for obtaining and processing new information. Second, we assume that firm and strategic supplier resources are difficult to imitate because they result from unique historical conditions, are socially complex, and the causal linkages between cooperation and performance are ambiguous (Barney, 1991). Cross-sectional survey research provides a snapshot of these resources. We encourage further research to conduct longitudinal case studies and explore the evolutionary dynamic processes involved. Finally, consistent with many studies that consider the contributions of suppliers to new product development, our data collection focused on the buyer side of the dyad. Future research should focus on the development of resources from either the supplier's or both partners perspectives.

Several avenues for future research are also evident. Our study contributes to the literature by highlighting the role of supplier capabilities and firm capabilities in new product advantage. These results should encourage future researchers to explore the micro-foundations of supplier technical capabilities and further assess the conditions under which strong supplier technical capabilities serve as complements or substitutes for firm resources. Further, while absorptive capacity are shown to help generate a new product advantage, future research is needed to investigate the role that buyer-supplier collaborative relationships play in aiding this new product advantage. Studies suggest that socialization mechanisms (Lawson, Petersen,

Cousins and Handfield, 2009) and social capital (Carey, Lawson and Krause, 2011), for example, facilitate inter-firm knowledge sharing and improved relational performance. The capabilities of the manufacturing firm itself may also influence these dynamics. Salvador and Villena (2013), for example, show that a firm's capabilities in design modularization can overcome cost and design diseconomies in integration of suppliers into product development. Finally, another fertile area for further research is whether the antecedents and consequences of supplier involvement and new product advantage are more robust under different environmental conditions, such as the level of technological turbulence, degree of uncertainty involved in the supplier's development task, or the newness of the end-product.

## Conclusions

This study applied resource-based and relational perspectives to investigate the resource configurations firms use to gain new product advantage, within the context of NPD projects that have extensively involved strategic suppliers. We find that different firm-specific and strategic supplier-specific resource configurations can lead to new product advantage, and indeed, substitute for one another in NPD (Hess and Rothaermel, 2011; Weigelt, 2013). Our findings in particular emphasize the important role that supplier's technical capabilities and the nature of the supplier task play in building a new product advantage. Further work examining different configurations of firm and supplier-specific resources in inter-organizational new product development projects is encouraged.

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**Figure 1. Theoretical Framework**

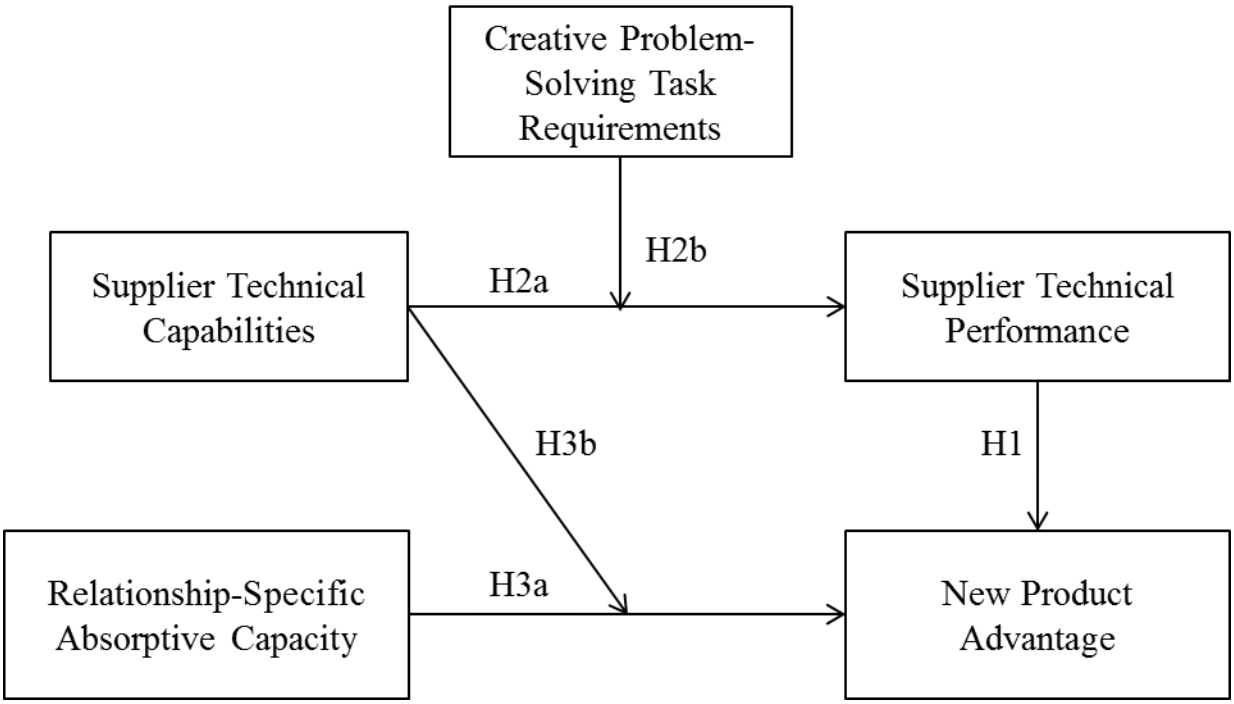

**Figure 2. Interaction of Supplier Technical Capabilities and Creative Problem-Solving Task Requirement on Supplier Technical Performance**

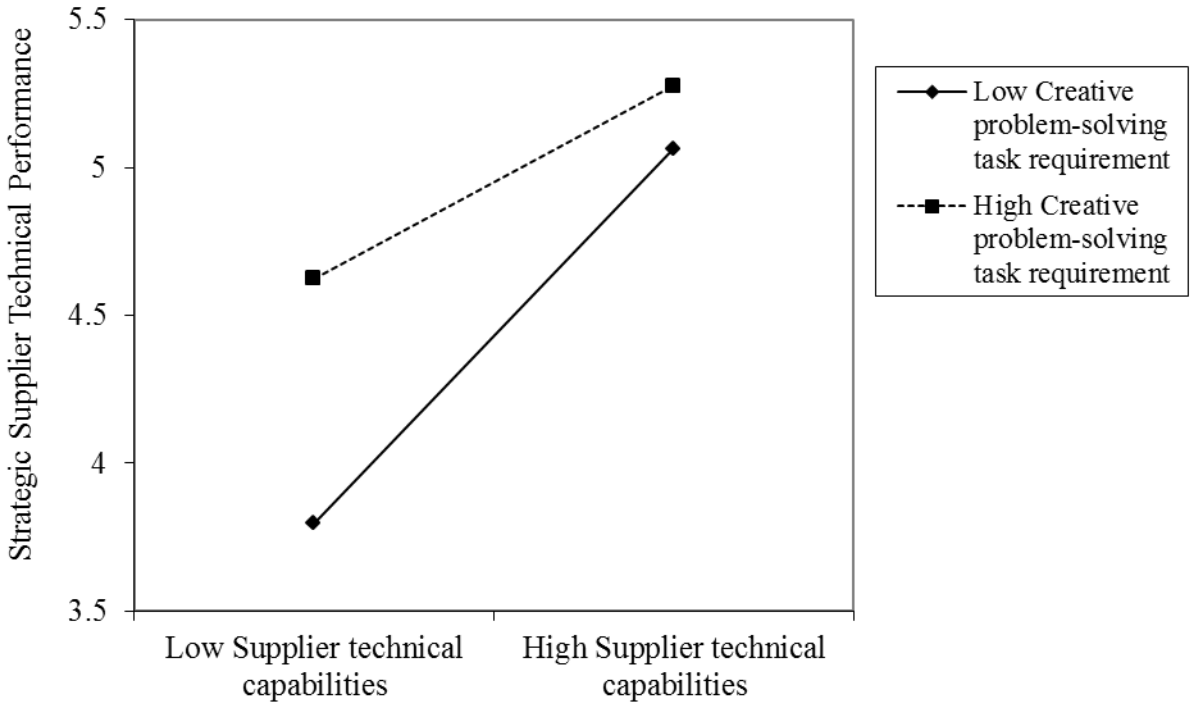

**Figure 3. Interaction of Relationship-Specific Absorptive Capacity and Supplier Technical Capabilities on New Product Advantage**

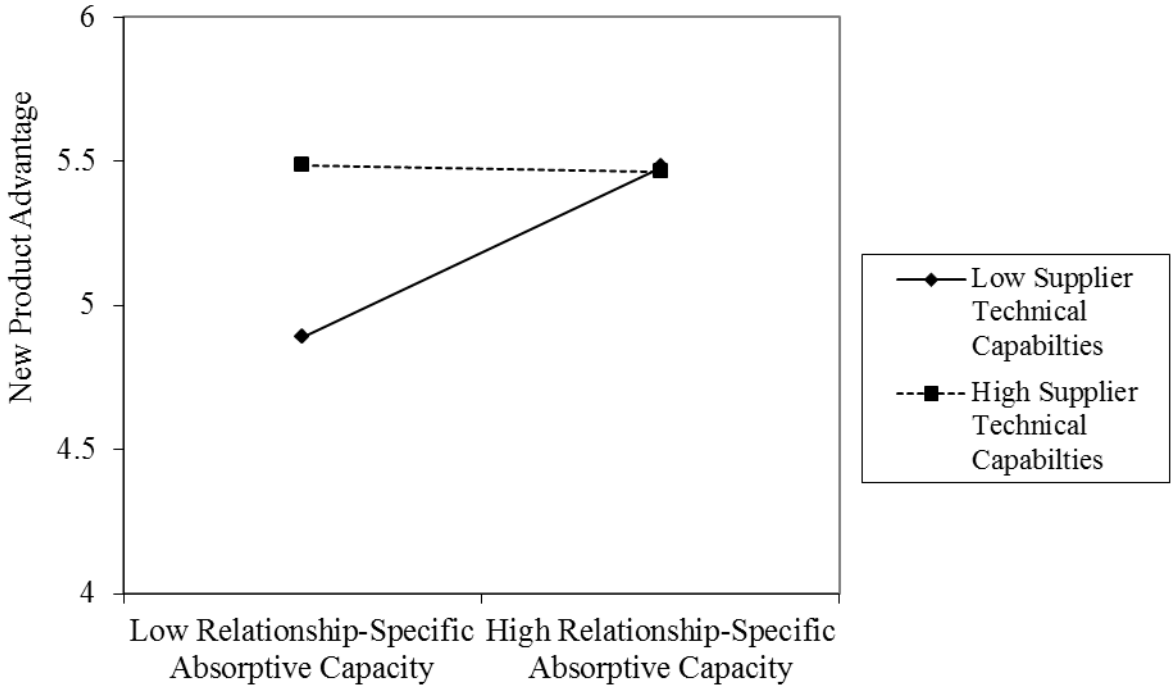

**Table 1. Sample Characteristics**

| **(1) Industry** | | **Frequency** | **%** |
|---|---|---|---|
| Aerospace | | 22 | 14.4 |
| Automotive | | 13 | 8.5 |
| Chemicals and chemical products | | 18 | 11.8 |
| Electronic and industrial equipment | | 54 | 35.3 |
| General manufacturing | | 17 | 11.1 |
| Pharmaceutical | | 16 | 10.4 |
| Not reported | | 13 | 8.5 |
| | *Total* | *153* | *100.0* |

| **(2) Business Units' Annual Sales** | | **Frequency** | **%** |
|---|---|---|---|
| Under £25M | | 52 | 34.0 |
| £25 - £50M | | 18 | 11.8 |
| £50 - £100M | | 15 | 9.8 |
| £100 - £250M | | 17 | 11.1 |
| £250 - £500M | | 15 | 9.8 |
| Over £500M | | 20 | 13.1 |
| Missing | | 16 | 10.5 |
| | *Total* | *153* | *100.0* |

| **(3) Titles** | | **Frequency** | **%** |
|---|---|---|---|
| Operations Manager | | 30 | 19.6 |
| R&D Manager | | 26 | 17.0 |
| Purchasing Manager | | 59 | 38.5 |
| Procurement Director | | 24 | 15.7 |
| Missing | | 14 | 9.1 |
| | *Total* | *153* | *100.0* |

| **(4) Location of Suppliers** | | **Frequency** | **%** |
|---|---|---|---|
| UK | | 75 | 49.0 |
| USA | | 14 | 9.1 |
| Germany | | 8 | 5.2 |
| France | | 5 | 3.3 |
| Europe other | | 21 | 13.7 |
| China | | 15 | 9.8 |
| Asia-Pacific | | 10 | 6.6 |
| Missing | | 5 | 3.3 |
| | *Total* | *153* | *100.0* |

**Table 2. Confirmatory Factor Analysis**

| Factors and Items | Standardized loading | Error Term | *t*-value |
|---|---|---|---|
| **New product advantage:** *Relative to competitors' products, our new product …* | | | |
| … Offered unique features or attributes to the customer | .92 | - | - |
| … Was clearly superior in terms of meeting customers' needs | .91 | .06 | 17.17 |
| … Had superior technical performance | .61 | .09 | 8.58 |
| … Offered higher quality – tighter specs, stronger, lasted longer, or more reliable | .65 | .07 | 9.36 |
| … Permitted the customer to do a job or do something he could not presently do | .84 | .06 | 14.72 |
| **Supplier Technical Performance:** *The supplier's technology will contribute a great deal …* | | | |
| … to the competitiveness of our products | .80 | - | - |
| … to the functionality of our products | .77 | .10 | 9.03 |
| … to the profitability of our products | .71 | .10 | 8.37 |
| **Supplier Technical Capabilities:** *This supplier…* | | | |
| … could incorporate the latest technology in their products | .81 | - | - |
| … was proficient with the latest technology | .94 | .07 | 14.54 |
| … was skilled at creating technological innovations | .95 | .08 | 14.61 |
| … was able to respond quickly to technological changes | .72 | .09 | 9.81 |
| … could offer a high degree of engineering support to us | .74 | .08 | 10.20 |
| **Relationship-Specific Absorptive Capacity :** *Relative to competitors, how well can your firm …* | | | |
| … Integrate our existing knowledge with new knowledge acquired from this supplier | .61 | .13 | 6.29 |
| … Exploit the new integrated knowledge into concrete applications | .62 | - | - |
| … Internal routines to analyse the knowledge obtained from this supplier | .89 | .16 | 7.80 |
| … We were able to identify, value, and import external knowledge from this supplier | .76 | .17 | 7.43 |
| **Creative Problem-Solving Task Requirement:** *The nature of the supplier's work …* | | | |
| The supplier's work demanded a lot of creativity and imagination | .77 | - | - |
| To perform its work well, the supplier had to be inventive and discover how to do new things | .64 | .13 | 6.85- |
| The technology produced by the supplier had to incorporate significant new knowledge | .78 | .12 | 7.63 |
| The technology was only a slight departure from technology that the supplier had produced before (a) | | | |

| | | | |
|---|---|---|---|
| **Long-Term Relationship Commitment:** *The nature of the supplier relationship …* | | | |
| Our relationship with this supplier is of very little significance to us (r) | .77 | - | - |
| Our relationship with this supplier is long-term in nature | .91 | .09 | 12.56 |
| We are committed to the preservation of this relationship | .94 | .10 | 13.01 |
| The supplier sees our relationship as a long-term alliance | .87 | .11 | 11.81 |
| We expect to be working with this supplier for the foreseeable future | .51 | .11 | 6.42 |
| | | | |
| **Evaluation Effort:** *The level of ex ante effort in evaluating the supplier's …* | | | |
| … Product quality | .81 | - | - |
| … Manufacturing capability | .66 | .08 | 8.36 |
| … Delivery capability | .81 | .07 | 10.55 |
| … Technical capability | .71 | .09 | 9.07 |
| … Financial viability | .76 | .08 | 9.87 |

[a] Deleted due to low loading

## Table 3. Correlation Matrix and Descriptive Statistics

| Variable[a,b] | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** New product advantage | **.90** | | | | | | | | | | | | | | | |
| **2.** Supplier technical performance | *.22* | **.81** | | | | | | | | | | | | | | |
| **3.** Relationship-specific absorptive capacity | *.25* | *.21* | **.81** | | | | | | | | | | | | | |
| **4.** Supplier technical capabilities | *.25* | *.56* | *.23* | **.91** | | | | | | | | | | | | |
| **5.** Creative problem-solving task requirement | .02 | *.39* | *.16* | *.40* | **.76** | | | | | | | | | | | |
| **6.** Industry - automotive | -.08 | -.02 | .01 | .09 | .03 | - | | | | | | | | | | |
| **7.** Industry - aerospace | -.09 | .07 | -.10 | .09 | .11 | -.12 | - | | | | | | | | | |
| **8.** Industry - electronics | *.17* | .09 | .05 | .05 | -.04 | *-.23* | *-.31* | - | | | | | | | | |
| **9.** Firm size (employees) | -.06 | .01 | -.04 | -.03 | .09 | .10 | .14 | -.10 | - | | | | | | | |
| **10.** Single supplier | .11 | -.04 | .08 | .05 | .00 | .16 | -.08 | -.08 | *-.19* | - | | | | | | |
| **11.** Relationship length | *.19* | .07 | .15 | .09 | .06 | .09 | -.01 | .05 | .13 | -.05 | - | | | | | |
| **12.** Evaluation effort | *.27* | *.22* | .15 | *.22* | .10 | .10 | .09 | -.07 | *.17* | -.13 | .14 | **.86** | | | | |
| **13.** Long-term relationship commitment | .03 | *.40* | *.23* | *.42* | *.18* | .06 | .07 | -.04 | .05 | -.01 | *.32* | *.27* | **.90** | | | |
| **14.** Technological newness | *.33* | -.03 | .00 | .06 | .05 | .04 | .04 | -.05 | .10 | .09 | -.10 | .02 | -.12 | - | | |
| **15.** Supplier responsibility | -.13 | .06 | .06 | .08 | *.24* | -.08 | .00 | -.07 | -.12 | .01 | -.15 | -.08 | -.13 | *-.18* | - | |
| **16.** Item importance | *.23* | .00 | -.07 | .10 | -.02 | -.12 | .06 | .07 | -.07 | .12 | -.07 | -.07 | -.09 | .15 | .03 | - |
| Mean | 5.29 | 4.63 | 4.74 | 5.20 | 3.93 | 0.08 | 0.14 | 0.36 | 5.56 | 0.59 | 3.86 | 5.37 | 5.91 | 2.71 | 0.30 | 0.42 |
| Standard deviation | 1.31 | 1.35 | 0.97 | 1.23 | 1.31 | 0.28 | 0.35 | 0.48 | 1.83 | 0.49 | 1.24 | 1.09 | 1.10 | 1.06 | 0.28 | 0.50 |
| Composite Reliability | 0.89 | 0.80 | 0.82 | 0.92 | 0.78 | | | | | | | 0.87 | 0.91 | | | |
| Average Variance Extracted | 0.63 | 0.58 | 0.53 | 0.70 | 0.54 | | | | | | | 0.57 | 0.66 | | | |

[a] Cronbach's alpha shown on the diagonal

[b] n=153; correlations ($p$ <.05) shown in italics.

**Table 4. Standardized Coefficient Estimates of Regressions**

| Variables | Supplier Technical Performance | Supplier Technical Performance | New Product Advantage | New Product Advantage |
|---|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| *Control variables:* | | | | |
| Industry - automotive | -.05 | -.05 | -.12 | -.15 |
| Industry - aerospace | .01 | .01 | -.10 | -.11 |
| Industry - electronics | .09 | .08 | .08 | .04 |
| Firm size (employees) | .00 | -.01 | -.09 | -.08 |
| Evaluation effort | .07 | .08 | .27*** | .30*** |
| Single supplier | -.03 | -.02 | .10 | .08 |
| Relationship length | -.05 | -.05 | .21** | .23*** |
| Long-term commitment | .20* | .20* | -.19* | -.22** |
| Technological newness | -.03 | -.03 | .29*** | .28*** |
| Supplier responsibility | .00 | -.01 | -.09 | -.10 |
| Item importance | -.02 | -.00 | .18** | .18** |
| *Main effects:* | | | | |
| Supplier technical capabilities | .40*** | .36*** | .12 | .09 |
| Creative Problem-Solving Task Requirement | .20** | .20** | | |
| Relationship-specific absorptive capacity | | | .16* | .14* |
| Supplier technical performance | | | .14* | .15* |
| *Interaction effects:* | | | | |
| Supplier technical capabilities * Creative Problem-Solving Task Requirement | | -.11* | | |
| Relationship-specific absorptive capacity * Supplier technical capabilities | | | | -.15** |
| $R^2$ | .40 | .42 | .40 | .43 |
| Adjusted $R^2$ | .35 | .36 | .34 | .36 |
| *F* | 7.21*** | 7.15*** | 6.61*** | 6.81*** |
| n | 153 | 153 | 153 | 153 |

*$p$<.05, **$p$<.01, ***$p$<.001; n=153

Two-tailed test for control variables; One-tailed for independent variables