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Identifying innovative suppliers in business networks: An empirical study

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ABSTRACT

In the literature, considerable attention has been given to the role of supplying firms in the context of innovation. However, not every supplier is capable of contributing to a buyer's innovation performance. In addition, the willingness and commitment of suppliers to collaborate with buyers is not always apparent. Thus far, the literature has not given a conclusive description of the nature of innovative suppliers due to a lack of empirical evidence. In this study, we seek to identify a set of characteristics that can identify those suppliers that can make significant contributions to a buyer–supplier collaboration. Our statistical analysis of survey data shows that a supplier's technical characteristics and collaborative attitude, and the buyer–supplier relational characteristics on buyer–supplier relationships explain an important part of a supplier's contribution to buyer innovation. At a theoretical level, the findings of this study explain why some suppliers contribute more effectively than others to buyer–supplier innovations. At a practical level, the findings provide managers with a more complete picture of those suppliers with the highest expected innovation contribution in their network.

1. Introduction

Business networks are an important source of the innovation performance of firms (Ahuja, 2000; Baum, Calabrese, & Silverman, 2000; Corsaro, Ramos, Henneberg, & Naudé, 2012; Wilkinson & Young, 2002). Industrial Marketing and Purchasing (IMP) theory posits that the interactions among actors, resources, and relationships in networks form an important basis for the technological development of industries (Håkansson, 1987; Roy, Sivakumar, & Wilkinson, 2004). From this perspective, IMP researchers strive to better explain innovation in business networks (e.g., Hoholm & Olsen, 2012; Ritter, Wilkinson, & Johnston, 2004). The interactions between firms enable the combination of existing ideas in new ways that are especially relevant to the creation of new ideas in the form of innovations (Ridley, 2010; Romer, 1990; Welch & Wilkinson, 2002). The literature on network collaborations focuses increasingly on buyer–supplier relationships (e.g., Wynstra, Von Corswant, & Wetzels, 2010). Many of these studies describe the positive effect of supplier involvement on buyer innovation, which is defined as "the encouragement of improvement by the supplier with regard to how the buyer solves problems, develops ideas, and thinks of (process) improvements" (Mooi & Frambach, 2012, p. 1025).

Although many scholars describe the positive effects of buyer–supplier relationships, merely involving any supplier in design programs does not guarantee direct improvements in innovation performance (Freytag, Clarke, & Evald, 2012; Liker, Kamath, Nazli Wasti, & Nagamachi, 1996). Choosing a supplier with the wrong capabilities can lead to lower innovation performance or even project obstruction (Wognum, Fisscher, & Weenink, 2002; Zsidisin & Smith, 2005). Buying firms can increase their innovative performance by collaborating with the most innovative suppliers. However, the most innovative supplier in a certain supply network cannot dedicate its best resources to every buyer (Gulati, Nohria, & Zaheer, 2000). Therefore, if competitive buying firms rely on the innovativeness of the same suppliers, then "it would be extremely difficult for a buyer to create competitive advantages through a shared supplier network" (Dyer & Hatch, 2006, p. 703). Without the commitment of innovative suppliers to exclusive relationships with specific buyers, firms might fail to obtain innovation contributions from their suppliers and therefore lose the ability to differentiate themselves from their competitors (Takeishi, 2001). Thus, to obtain greater innovation value from their relationships with the suppliers in their networks, buying firms need to identify those suppliers that are both capable and willing to contribute to innovations for the buyers.

In the IMP literature, some theoretical frameworks that can be used to identify innovative suppliers have been proposed. For example, Rese (2006) introduces a decision model for selecting the 'right' supplier. Schiele (2006) proposes a framework in which he introduces supplier characteristics as well as relational characteristics that are argued to have a positive effect on buyer–supplier innovations. Even though early IMP studies empirically explored the different functions of buyer–supplier relationships (e.g., Håkansson & Snehota, 1995; Walter, Ritter, & Gemünden, 2001), the literature provides few empirical insights into the antecedents of buyer–supplier innovation. Without a clear empirical indication of the nature of innovative suppliers, it would be very difficult for buying firms to fully benefit from the potential innovation value present in their supplier networks. In this study,

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we attempt to shed light on this issue by analyzing survey data in which the innovation contributions of 242 suppliers are evaluated by their buying firms. The main questions driving this paper are the following: What characteristics of suppliers might signal their high potential for making an innovative contribution to a buying firm, and how can a buying firm obtain an exclusive commitment from a supplier in order to achieve a better innovation contribution than their competitors?

To answer these questions, we develop and test a framework to (1) empirically identify the *supplier characteristics* that explain the innovation potential of different suppliers, (2) examine the *supplier's collaborative attitude* and identify how a supplier's willingness to collaborate enables the buying firm to better exploit the innovation capabilities of the supplier, and (3) determine which *relational characteristics* lead to a stronger supplier commitment resulting in a greater innovation contribution from the supplier.

2. Conceptual framework and hypotheses

The physical and social interactions in business networks enable firms to exchange and combine existing knowledge and create new knowledge (Mouzas & Ford, 2009; Romer, 1990). Different types of network collaborations can provide firms with different types of knowledge, ultimately leading to higher innovation performance (Ahuja, 2000; Baum et al., 2000; Laursen & Salter, 2006). Many potential innovation partners can be distinguished and different types of innovations can result from these collaborations. Von Hippel focused on the role of lead users in the innovation process (Thomke & Von Hippel, 2002; von Hippel, 1988). Chesbrough (2003) identifies the advantages of involving other companies in "open innovation" processes, naming the growing competence of suppliers as one reason for the advent of open innovation. This paper focuses on buyer–supplier collaborations. Buyer–supplier collaborations are important sources for innovation (Walter et al., 2001; Young, Wiley, & Wilkinson, 2009) and have been shown to result in a wide range of innovation outcomes (Song & Di Benedetto, 2008; Soosay, Hyland, & Ferrer, 2008).

2.1. Characteristics of innovative suppliers

In the literature that focuses on the characteristics of suppliers in buyer–supplier innovation, the characteristics of individual suppliers are assumed to be important factors. In particular, much attention has been paid to suppliers' technical characteristics, which are typically expressed in measurable terms (Ho, Xu, & Dey, 2010; Park & Krishnan, 2001). However, as these technical characteristics are exploited by the buying firm, Croom (2001) argues that the effectiveness of the interaction between the buyer and supplier might be determined also by the collaborative attitude of the supplier.

A collaborative attitude is the cooperative propensity or external orientation embedded in a supplier's organization (Bidault, Despres, & Butler, 1998; Deshpandé, Farley, & Webster, 1993). A supplier might possess innovative capabilities, but without the willingness to collaborate, these capabilities might not be utilized effectively. Therefore, whereas much of the recent literature on supplier evaluation and selection focuses on so-called "hard facts" (i.e., the analysis of criteria such as certifications and R&D expenditures using multi-criteria approaches), recent conceptual works argue that not only these technical aspects but also aspects of the supplier's attitude towards the collaboration should be considered as well (Croom, 2001; Schiele, 2006). Therefore, to obtain a more complete picture of the characteristics of innovative suppliers, this study differentiates between the technical characteristics and the collaborative attitude of the supplier.

2.2. Buyer–supplier relational characteristics

To fully examine the characteristics of the supplier's contribution to buyer innovation, not only the supplier characteristics but also the relational characteristics of the buyer–supplier relationship are relevant (Azadegan, Dooley, Carter, & Carter, 2008; Croom, 2001; Schiele, 2006). Collaborations with external partners have become important mechanisms for firms to enhance their innovation capabilities. Subsequently, the number of inter-firm collaborations has increased substantially over the past decades and these collaborations have become a central strategic component for many firms (Lavie, 2007). As more and more buying firms seek similar collaborations with the same innovative suppliers, it becomes increasingly difficult for these buyers to mobilize supplier's resources and gain an advantage over competitors that are sourcing from the same supply base (Ellegaard & Koch, 2012). This phenomenon, where more and more buying firms seek similar collaborations with the same suppliers, has been described mainly from a resource-based perspective, as innovative suppliers might have enough resources to satisfy only a limited number of buyers (Gulati et al., 2000). Therefore, suppliers must decide which buyer will receive their primary innovative resources and thereby benefit in terms of innovations.

To obtain a full understanding of the characteristics that play a distinguishing role in the contribution of a supplier to buyer–supplier innovation, a conceptual model is constructed in which three groups of constructs are identified: (1) supplier characteristics, (2) the supplier's collaborative attitude, and (3) the relational characteristics of the buyer–supplier relationship. Fig. 1 shows the conceptual model used in this study.

2.3. Conceptual model and hypotheses

2.3.1. Supplier characteristics: Professionalism

A firm's internal innovation activities have been shown to influence their innovation collaborations with external partners (Cassiman & Veugelers, 2006). For example, Salomo, Weise, and Gemünden (2007) show how process management capabilities directly improve a firm's innovation performance, whereas Naveh (2007) and Scott-Young and Samson (2008) focus on role process formalization, pre-defined milestones, and prioritized goals to explain innovation performance. Furthermore, higher levels of project management capabilities have been shown to lead to higher levels of new product development (NPD) performance (Ethiraj, Kale, Krishnan, & Singh, 2005).

Petroni and Panciroli (2002) link suppliers' project management competences to innovation and find that the best performing buyer–supplier relationships "show a distinctive profile in terms of project management competence" (p.146). In addition to the direct and indirect effects of these competences on innovation, the process and project management capabilities indicate a certain organizational maturity that are often used as prerequisites in audits used by buying firms to evaluate suppliers (Moultrie, Clarkson, & Probert, 2007). Suppliers that exhibit high levels of professionalism (i.e., skills, competence, and expertise) can be expected to make a greater contribution to an innovative collaboration than their peers with lower levels of professionalism. Consequently,

H1. *Suppliers with higher levels of professionalism make a greater innovation contribution in a buyer–supplier relationship.*

2.3.2. Supplier characteristics: R&D expenditure

If the aim of a buyer–supplier collaboration is an innovative outcome, an important set of factors would be the so-called "hard facts" describing a supplier's innovative capabilities. Suppliers that have well-developed innovation capabilities can be expected to make a greater contribution to the innovations of their buying firms. Expenditure on innovation is used often to assess this innovation capability. Firms with a higher R&D investment per employee are more likely to be innovative (Griffith, Huergo, Mairesse, & Peters, 2006). In an analysis of 170 UK firms during the period 1988–1992, Wakelin (2001) found that innovative firms have substantially higher R&D expenditures than non-innovative firms.

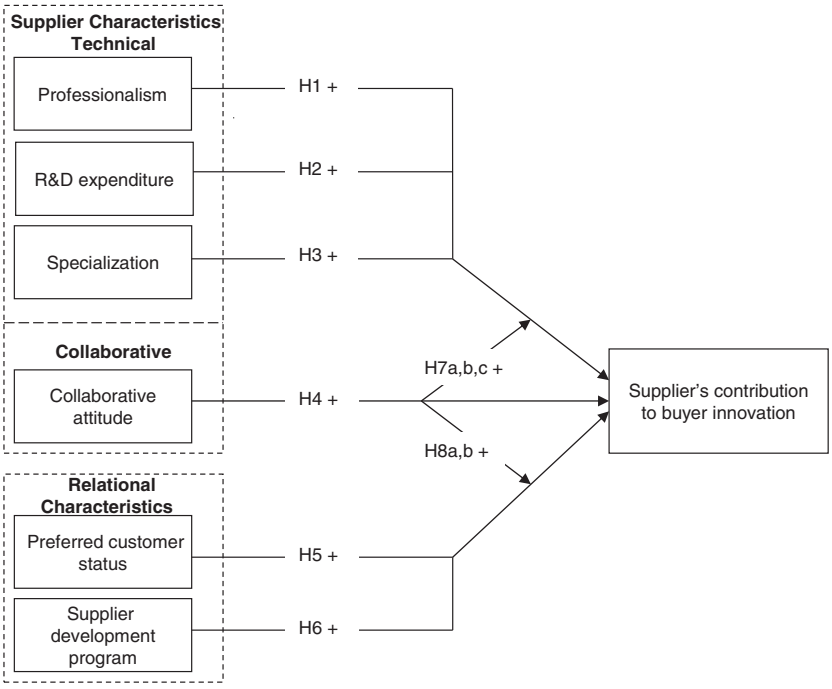

Fig. 1. Conceptual model for studying a supplier's contributions to buyer innovation.

Suppliers with higher levels of R&D expenditures can be expected to be more innovative. Therefore, these suppliers might be more suitable partners for collaborating with buying firms in innovation programs. Azadegan et al. (2008), for instance, provide an example of how Dell relies more heavily on Tier 1 suppliers with larger R&D expenditures than Dell itself for the design of new products. Because the R&D expenditures of suppliers can be expected to increase a buyer's innovation performance, it is hypothesized that

H2. *Suppliers with higher levels of R&D expenditures make a greater innovation contribution in a buyer–supplier relationship.*

2.3.3. Supplier characteristics: Specialization

An important reason for buyers to outsource certain activities is to access skills and knowledge that are not available in-house (Beaumont & Sohal, 2004). Buyers compensate for their lack of internal knowledge by making use of external sources such as suppliers' areas of specialization. A broader set of specialized suppliers, therefore, provides the buyer with a broader knowledge base. Or, as Ahuja (2000, p. 429) states, "by tapping into the developed competencies of other firms, firms can enhance their own knowledge base and thereby improve their innovation performance." Specialization refers to a supplier's unique or differentiating capabilities (Dyer, 1996), which can be combined with the buying firm's own knowledge and expertise to lead to innovations.

In the literature on supplier selection, various supplier typologies link the level of supplier specialization to innovation. Kaufman, Wood, and Theyel (2000), for instance, classify specialized suppliers as "technology specialists" and associate specialization with innovativeness because of the design capabilities of these suppliers. Petroni and Panciroli (2002) describe how suppliers categorized as "de-specialized" tend to be the least innovative suppliers in buyer–supplier relationships. Focusing on organizational innovation rather than collaborative innovation, Damanpour (1991) found that specialization tends to positively affect innovation. By sourcing technically specialized suppliers, buyers can obtain sophisticated and creative inputs (knowledge outside of their own core competences) for their projects. Thus,

H3. *More highly specialized suppliers make a greater innovation contribution in a buyer–supplier relationship.*

2.3.4. Supplier characteristics: Collaborative attitude

A main aim of innovation through buyer–supplier collaboration is the synergy that results from knowledge sharing. An important aspect of a successful buyer–supplier relationship is, therefore, that both parties have the capability to collaborate constructively (Allred, Fawcett, Wallin, & Magnan, 2011). Cabral and Traill (2001) describe how innovative suppliers tend to engage in several collaborative relationships. Past collaborations contribute to a better understanding of the partner firm (Andersen & Christensen, 2000) and a higher level of collaborative experience. The experience that suppliers gain in previous collaborations contributes to their open attitude towards collaborations. This positive collaborative attitude enables interaction and collaboration between the buyer and supplier (Lockström, Schadel, Harrison, Moser, & Malhotra, 2010). Mishra and Shah (2009) show how a collaborative attitude and competences at a firm level lead to a higher performance outcome from a firm's alliances.

A firm's attitude towards collaboration may relate to its experiences with collaboration. Therefore, firms develop different attitudes towards collaboration, and not all firms can be expected to have collaborative attitudes (Cagliano, Caniato, Corso, & Spina, 2005). A collaborative attitude provides a greater opportunity for inter-firm relationships and renders better outcomes (Powell, Koput, & Smith-Doerr, 1996). A positive collaborative attitude entails a supplier's openness towards collaborative activity. A participative and collaborative organizational attitude has been shown to increase a firm's innovativeness (Hurley & Hult, 1998). This attitude, for example, explains why some suppliers are more proactive than others in involving themselves in a buyer's development projects (von Corswant & Tunälv, 2002). Therefore,

H4. *Suppliers that have a collaborative attitude make a greater innovation contribution in a buyer–supplier relationship.*

2.3.5. Relational characteristics: Preferred customer status

To increase innovation performance through collaboration, both the buyer and supplier must be willing to invest in their relationship. However, a supplier's willingness to collaborate is not always apparent (Essig & Amann, 2009). Suppliers might become highly selective and may not allocate their resources equally to all of their customers (Mitsuhashi & Greve, 2009). In these situations, the buying firms

compete for the benevolence of their suppliers (Schiele, Veldman, Hüttinger, & Pulles, 2012).

If a buying firm appears "attractive" to a supplier, then the latter is more likely to collaborate with this buyer rather than with the buyer's competitors (Ellegaard, Johansen, & Drejer, 2003; Ramsay & Wagner, 2009). Therefore, a buying firm that becomes more attractive than their competitors to suppliers can be expected to obtain commitments with greater ease from their suppliers. Eventually, the buying firm may attain a *preferred customer status*. If a buying firm is a preferred customer, the supplier is more likely to, for example, allocate its best personnel to collaborative development or offer innovations that are not available to the buying firm's competitors (Hüttinger, Schiele, & Veldman, 2012). Therefore, a preferred customer status may result in better access to the supplier's innovative resources. Preferential resource allocation has, for example, been explained to be an important factor for the competitiveness of firms in regional clusters (Pulles & Schiele, 2013). Consequently, it can be expected that a buyer's preferred customer status has a positive effect on the innovation performance of a buyer–supplier relationship. Therefore,

H5. *Suppliers granting a buyer preferred customer status make a greater innovation contribution in a buyer–supplier relationship.*

2.3.6. Relational characteristics: Supplier development programs

To attain high innovation performance through collaboration, it is important for the buying firms to have highly capable suppliers. Related to the exploitation–exploration dichotomy (Benner & Tushman, 2003), firms can decide to develop the capabilities of existing suppliers (i.e., exploitation) rather than switching to another supplier (i.e., exploration) (Trent & Monczka, 1999). Supplier development is the joint effort by the buyer and the supplier to improve the supplier's performance in order to meet the buyer's supply needs (Krause, 1999). In the process of supplier development, new ideas emerge through the intensive collaboration between buyer and supplier. In addition to the direct effect of these programs on suppliers' capabilities, supplier development programs may intensify the buyer–supplier relationship.

Supplier development involves close collaboration in which both parties must invest in knowledge transfer activities. This interaction has a positive effect on the relationship between the buyer and the supplier (Krause, 1997). The joint actions between firms and the trust resulting from the relationship "are the two most critical factors in supplier development to enhance competitive performance of the buyer." (Li, Humphreys, Yeung, & Edwin Cheng, 2007, p. 244). The mutual familiarity and trust resulting from cooperation in program development form an important starting point for collaborative innovations (Moran, 2005). The commitment of both the supplier and the buyer in supplier development has been shown to have a positive effect on the outcomes of the relationship (Krause, Handfield, & Tyler, 2007). Therefore,

H6. *Suppliers taking part in supplier development programs make a greater innovation contribution in a buyer–supplier relationship.*

2.3.7. Moderating effects

This paper's five main hypotheses describe a direct effects model in which all of the constructs relate directly to the supplier's contribution to buyer–supplier innovation processes. However, it can be argued that suppliers with strong collaborative attitudes are better able to utilize relational interfaces and exploit their innovative capabilities in collaborations with buyers. Following this argument, it can be expected that adding the moderating effects of the collaborative attitude construct to the direct effects model will increase the model's explanatory value. Therefore, five additional interactions have been specified in this study's conceptual model.

First, moderating effects are expected to exist between a supplier's collaborative attitude and its innovation characteristics (H7a, H7b, H7c). In order for buying firms to be effective in exploiting their suppliers' technical characteristics, effective knowledge sharing between the partners must take place. Innovation knowledge and best practices are transferred more easily when the supplier has a positive attitude towards collaboration (Hansen, 2002). Consequently, the collaborative attitude is an important enabler for interorganizational knowledge transfers (Cormican & O'Sullivan, 2004). Suppliers with a collaborative attitude are better able to exploit their innovative capabilities within collaborations (Powell et al., 1996; Walter, 1999). Therefore, the more positive the supplier's collaborative attitude, the better the supplier can be expected to use its technical characteristics (i.e., professionalism, R&D expenditure, and specialization) for the benefit of the buying firm. Therefore,

H7a. *The supplier's collaborative attitude positively moderates the relationship between the supplier's professionalism and the supplier's innovation contribution in a buyer–supplier relationship.*

H7b. *The supplier's collaborative attitude positively moderates the relationship between the supplier's R&D expenditure and the supplier's innovation contribution in a buyer–supplier relationship.*

H7c. *The supplier's collaborative attitude positively moderates the relationship between the supplier's specialization and the supplier's innovation contribution in a buyer–supplier relationship.*

Finally, moderating effects are expected to exist between a supplier's collaborative attitude and the buyer–supplier relational characteristics (H8a and H8b). The lack of a collaborative attitude makes it difficult for partners to exploit existing relations to share information and build trust (Spekman & Carraway, 2006). Therefore, firms that have a strong commitment towards collaboration can be expected to better utilize the existing relational infrastructure between firms. Hult (1998) showed how organizational learning within collaborations leads to a greater relationship commitment and customer orientation in the supplying firm. According to Bosch-Sijtsema and Postma (2009), partners with a collaborative attitude not only have access to each other's technological capabilities but also develop and share knowledge about organizational aspects. Because these studies suggest that the collaborative attitude is an important factor for the exploitation of buyer–supplier relationships, it can be expected that the collaborative attitude strengthens the effects mentioned in hypotheses 5 and 6. The following is hypothesized:

H8a. *The supplier's collaborative attitude positively moderates the relationship between the preferred customer status and the supplier's innovation contribution in a buyer–supplier relationship.*

H8b. *The supplier's collaborative attitude positively moderates the relationship between the supplier's development programs and the supplier's innovation contribution in a buyer–supplier relationship.*

3. Methodology

3.1. Data

To test these hypotheses, this study surveyed 121 firms to collect data. To prevent selection bias, it was necessary to not limit the study to only successful innovation collaborations. Therefore, to obtain a good distribution in terms of supplier contributions, this paper followed a suggestion made by Ulaga and Eggert (2006). The respondents assessed an *excellent performing supplier* and a *disappointing supplier* in terms of product and process innovation. The respondents were asked to write down the names of these two suppliers on separate sheets of paper. Then, they answered the questionnaire for both the suppliers. Therefore, the questionnaires from 121 respondents represented data for approximately 242 suppliers. The survey was pretested by five academic and seven practitioners, all knowledgeable in the field of buyer–supplier relations.

Invitations to participate in the survey were distributed among members of the German and Austrian associations of materials management, purchasing, and logistics and to a list of contacts of a German business consulting firm that specialized in supply management. Respondents were invited to participate in the survey through e-mail and newsletters that contained a link to a homepage with the questionnaire. This homepage was opened 440 times and 121 usable questionnaires were received. This response rate of 27.5% is comparable to other studies using online survey instruments (e.g., Briggs, Landry, & Daugherty, 2010). To test for non-response bias, we compared the data from early respondents to late respondents for the key variables in this study (Armstrong & Overton, 1977). Respondents were found to differ significantly on only one of this study's variables (Supplier Specialization), which suggests that the threat of non-response bias is small. Comparative *t*-tests found no significant differences between respondents from the two associations and the consulting firm.

Among the respondents, 41.3% were purchasing managers, 34.7% were purchasers, and 24% served in other roles. Comparative *t*-tests showed no significant differences between respondents from purchasing functions and other functions with respect to this study's key variables. Legler and Frietsch (2007) defined medium- and high-tech sectors in German industry as sectors that invest between 2.5% and 7% and more than 7% of their turnover in R&D, respectively. A substantial proportion of our respondents are in the medium-tech (e.g., automobile and mechanical engineering) and high-tech (e.g., electronic engineering) sectors of German industry. With an average R&D expenditure of 7.9%, our sample seems to be a reliable representation of Germany's medium- and high-tech sectors (Table 1).

3.2. Measures

Supplier contributions in buyer–supplier innovations were operationalized using items that reflect collaborative innovation (Krause, Pagell, & Curkovic, 2001). These items emphasize how the respondents experience the contribution of each supplier to their firm's innovation process by indicating the supplier's pro-activeness in approaching the buyer with innovative ideas, the capability and extent to which the supplier supports the buyer in collaborative product development and process improvement, and the supplier's willingness to share technological information.

Supplier professionalism was measured with items based on a study by Petroni and Panciroli (2002), who mention the relevance of certifications and project management capabilities. The items for supplier specialization are based on a study by Wasti and Liker (1999), who found that specialized firms supply specific products to a limited market with a relatively small number of competitors. This study modeled the specialization construct in terms of formative indicators. This is consistent with Jarvis, MacKenzie, and Podsakoff (2003), who argue that the use of formative items is appropriate when all indicators have an impact on a construct and are, therefore, defining characteristics.

For supplier R&D expenditures, the respondents were asked to assess each supplier's R&D expenditure as a percentage of the annual turnover. Suppliers' collaborative attitude was measured with three items, all reflecting the attitude of the supplier towards collaboration: (1) involvement in collaboration, (2) management focus, and (3) upstream collaboration initiatives. The buyer's preferred customer status was operationalized with items adopted from Ganesan (1994). The items measure preferential treatment, or 'vendor's benevolence', by evaluating a supplier's commitment and willingness to make additional efforts for the buyer. Finally, the development program construct was operationalized on the basis of a study by Kocabasoglu and Suresh (2006). The complete measurement instrument, is shown in Appendix A.

Table 1
Profile of the sample.

	Frequency
No. of employees	
0–100	10.7%
101–500	24.3%
501–1000	14.5%
1001–10000	37.9%
>10000	12.6%
Industry sector	
Electrical/electronic engineering	21.5%
Mechanical engineering/machine building	17.4%
Service	10.7%
Chemicals, rubbers, and plastics	10.7%
Automobile	9.1%
Other manufacturing	13.2%
Other	17.4%
Annual sales (€)	
0–50 Million	24.0%
51–100 Million	12.5%
101–500 Million	20.8%
501–1000 Million	13.5%
>1000 Million	29.2%

3.3. Control variables

Several variables that could affect suppliers' innovation contributions were introduced as control variables in the analysis. First, because mutual dependency has been shown to influence relational behavior (Ganesan, 1994), this study controlled for buyer and supplier dependence terms of the difficulty of quickly replacing the partner (adopted from Corsten & Felde, 2005). Second, because the physical distance between two firms might influence innovation contributions in different ways (Schiele, 2006), this study controlled for the proximity between buyer and supplier. Third, buyer turnover and R&D expenditure were controlled because they may relate to the innovation performance of the organizations.

3.4. Data analysis and validity

Partial least squares (PLS) structural equation modeling was employed to test the hypotheses. PLS is a regression-based structural equation modeling (SEM) technique that does not make assumptions about data distributions. This study used PLS for three major reasons. First, PLS is ideally suited to test models with latent variables, especially during the early stages of theory development and in exploratory studies (Birkinshaw, Morrison, & Hulland, 1995). Second, unlike covariance-based structural equation modeling, PLS allows for both formative and reflective indicators. Third, as Reinartz, Haenlein, and Henseler (2009) show PLS is recommended when the number of observations is less than 250. This study used SmartPLS 2.0 (Ringle, Wende, & Will, 2005) to obtain the estimates.

To test for the common method variance, Harman's single factor test (Podsakoff & Organ, 1986) was used. In this test, all items used to construct the measures were entered into a principal component factor analysis with varimax rotation. A total of five components with eigenvalues greater than 1.0 were extracted; these components explained more than 68% of the total variance. The first factor accounted for 32% of the variance, which indicates that no single factor accounts for most of the covariance. These results suggest that common method variances do not pose a serious threat in this study.

Several study quality criteria were assessed. Composite reliability ranged between 0.72 and 0.93, exceeding Nunnally's (1978) threshold of 0.7. An examination of the average variance extracted (AVE) revealed that all constructs exceeded the 0.50 cut-off (Fornell & Larcker, 1981). Discriminant validity was tested using the Fornell and Larcker (1981). The correlation of the latent variables was compared to the square root of the average variance extracted. None of the correlations exceeded the value of the squared AVE, indicating a satisfactory level of discriminant validity.

Finally, to examine whether observed correlations between the independent variables caused multicollinearity problems, a

multicollinearity test was conducted. The tolerance and corresponding Variance Inflation Factor (VIF) are commonly used measures to conduct collinearity diagnostics for independent variables (Miles & Shevlin, 2001; O'Brien, 2007). None of the tolerances are less than 0.2 (corresponding to a VIF of 5), which points to the absence of multicollinearity (Hair, Anderson, Tatham, & Black, 1995; MacCallum & Browne, 1993). Together with the validity measures and correlations, the tolerance and VIF values are shown in Table 2.

4. Results

To test the size and statistical significance of the hypothesized paths, a bootstrapping procedure using 1500 resamples was used. Because a main objective of this study is to test the influence of different factors on the innovation contributions of suppliers, the results are obtained for four different models. Model I tests the effects of the technical supplier characteristics, Model II adds the collaborative attitude as a supplier characteristic, and Model III also includes the relational characteristics testing H1–H6. Finally, Model IV tests the hypothesized interaction effects (H7a, H7b, H7c, H8a, and H8b).

4.1. Direct effects

As the left column of Table 3 shows, the technical supplier characteristics (Model I) account for 57% of the variance in a supplier's contribution to buyer–supplier innovations (i.e., $R^2 = 0.57$). When the collaborative attitude items are added (Model II), the R^2 increases to 0.67. Finally, the relational characteristics are added (Model III), which increases the R^2 to 0.73. The results show that the values of the suppliers' professionalism ($\beta = 0.20$; $p < 0.01$), specialization ($\beta = 0.14$; $p < 0.01$), and collaborative attitude ($\beta = 0.27$; $p < 0.01$) are positively related to supplier innovation contribution, supporting H1, H3, and H4. The relationship between suppliers' R&D expenditures is found to be not significant. Therefore, H2 is not supported. With regard to the relational characteristics, the results show that the preferred customer status ($\beta = 0.24$; $p < 0.01$) and supplier development program ($\beta = 0.18$; $p < 0.01$) constructs have a significant positive effect, supporting H5 and H6.

4.2. Interaction effects

Next, the interaction variables are included in the model in addition to the main effects. Because the model contains formative measures for supplier specialization, the product terms of the variables were calculated using the latent variable scores (cf. Wynstra et al., 2010). The right column of Table 3 shows the results for the fourth model. The R^2 value of the model (including the interaction effects) is 0.75. This result demonstrates that the interaction between a supplier's collaborative attitude and the other antecedents improves the explained variance in a supplier's contribution to buyer–supplier innovations. The paths of H1–H6 show slightly changing β values, but all β values remain significant.

The interactions between a supplier's collaborative attitude and supplier professionalism, and their supplier development programs are found to be significant ($\beta = 0.07$ with $p < 0.05$ and $\beta = 0.08$ with $p < 0.05$, respectively). However, the positive interaction effect with the other variables was not significant. Moreover, a negative interaction is observed between collaborative attitude and supplier specialization. Hence, the results support H7a and H8b, but not H7b, H7c, and H8a. In Model I and Model II, the buyer dependency variable was found to be significant. In the models that include all of the hypothesized effects (Model III and IV), no control variables were found to be significant.

Table 3 shows Cohen's (2001) f^2 statistic that indicates the size of the effect (0.02, 0.15, and 0.35 are small, medium, and large effects, respectively) of the added variables. Adding the collaborative attitude (Model II) and, subsequently, the relational characteristics (Model III) account for medium-to-large size effects of 0.30 and 0.22, respectively. To compare the effect sizes of supplier characteristics, collaborative attitude, and relational characteristics, two additional models were tested: one model with all variables except the technical supplier characteristics and interaction terms ($R^2 = 0.68$), and another model with all of the variables except the collaborative attitude and interaction terms ($R^2 = 0.70$). These results showed that the set of technical supplier characteristics has an effect size of 0.19, the collaborative attitude has an effect size of 0.11, and the relational characteristics have an effect size (as shown in Table 3) of 0.22. When the interaction terms are added to Model IV, the R^2 increases by 0.02, which represents an f^2 of 0.08 and indicates a small-to-medium moderating effect (Cohen, 2001).

Fig. 2 shows this study's structural model.

5. Discussion and implications

5.1. Discussion of the results

The supplier characteristics of professionalism and specialization are found to have a positive effect on suppliers' innovation contributions to the buyer–supplier relationship (H1 and H3). These findings are consistent with a body of literature that assumes that suppliers' specialization and professionalism positively relate to buyer–supplier innovativeness (e.g., Krause et al., 2001; Ragatz, Handfield, & Petersen, 2002). Interestingly, although firms with higher R&D expenditures are found to be more innovative (Griffith et al., 2006), and large firms with low R&D expenditures can, in some cases, rely on suppliers' expenditures (Azadegan et al., 2008), this study found that a supplier's R&D expenditure does not directly affect the supplier's innovation contribution in buyer–supplier relationships. These findings suggest that supplier professionalism and specialization (as well as relational characteristics, see below) might matter more for buyers seeking an innovative contribution from suppliers. The insignificance of the R&D expenditure could indicate that suppliers do not always allocate their assets to the

Table 2
Collinearity statistics and correlations.

	Validity measures		Collinearity statistics		Correlations					
Variables	CR	AVE	Tolerance	VIF	SP	SSSP	SRD	SCA	PCS	SDP
SIC	0.93	0.78	–	–						
SP	0.72	0.77	0.58	1.72	–					
SSP	–	–	0.77	1.30	−0.05**	–				
SRD	–	–	0.84	1.19	0.28**	0.10	–			
SCA	0.82	0.60	0.39	2.60	0.53**	0.11	0.11	–		
PCS	0.93	0.74	0.40	2.51	0.43**	0.22**	0.18*	0.68**	–	
SDP	0.84	0.52	0.58	1.73	0.37**	0.21**	0.16*	0.57**	0.51**	–

**Pearson correlations significant at the $p < 0.01$ level, *significant at $p < 0.05$ level.
SIC = Supplier Innovation Contribution, SP = Supplier Professionalism, SSP = Supplier Specialization, SRD = Supplier R&D Expenditure, SCA = Supplier Collaborative Attitude, PCS = Preferred Customer Status, SPD = Supplier Development Programs.
AVE = average variance extracted, CR = composite reliability. AVE and CR of the formative construct SSP cannot be given, SRD has only one item and, therefore, no AVE and CR are given.

Table 3
PLS analyses (dependent variable: supplier innovation contribution).

Independent variables	PLS (Model I)	PLS (Model II)	PLS (Model III)	PLS (Model IV)
Supplier characteristics				
Professionalism	0.39 (7.29)**	0.22 (3.99)**	0.20 (4.77)**	0.19 (3.99)**
R&D expenditure	0.02 (n.s)	0.05 (n.s.)	0.03 (n.s.)	0.03 (n.s)
Specialization	0.39 (7.13)**	0.22 (4.47)**	0.14 (2.55)**	0.11 (1.89)*
Collaborative attitude		0.47 (8.4)**	0.27 (4.57)**	0.27 (4.21)**
Relational characteristics				
Preferred customer status			0.24 (4.78)**	0.32 (5.01)**
Supplier development program			0.18 (3.52)**	0.20 (3.58)**
Interaction of collaborative attitude with:				
Professionalism				0.07 (1.65)*
R&D expenditure				0.00 (n.s.)
Specialization				−0.12 (2.82)**
Preferred customer status				0.06 (n.s.)
Supplier development program				0.08 (1.90)*
Control variables				
Buyer dependency	0.18 (3.57)**	0.09 (2.05)*	0.04 (n.s.)	0.01 (n.s.)
Supplier dependency	0.04 (n.s.)	0.04 (n.s.)	0.01 (n.s.)	−0.01 (n.s.)
Proximity	0.01 (n.s.)	0.03 (n.s.)	0.03 (n.s.)	0.03 (n.s.)
R&D expenditure buyer	−0.04 (n.s.)	−0.04 (n.s.)	−0.02 (n.s.)	−0.01 (n.s.)
Turnover	0.00 (n.s.)	0.03 (n.s.)	0.03 (n.s.)	0.06 (n.s.)
R^2	0.57	0.67	0.73	0.75
f^2	–	0.30	0.22	0.08

Path coefficients (t-values) $^{*}p < 0.05$, $^{**}p < 0.01$, n.s. = non significant.

relationship with a particular buyer. In addition the results show that a supplier's collaborative attitude (H4) represents a substantial fraction of the explained variance of the suppliers' innovative contribution, thereby indicating empirical evidence for several propositions made in earlier conceptual work (e.g., Rese, 2006; Schiele, 2006).

This study expected that a buying firm's preferred customer status and supplier development programs would have a positive effect on a supplier's contribution to the buying firm's innovations (H5 and H6). These expected effects were found to be significant. These results indicate that attaining an effective innovation contribution is not merely a matter of selecting the supplier with the right characteristics. Building a relationship through development programs and attaining a preferred customer status could, therefore, be considered at least equally important to, or, as Cohen's f^2 statistic indicates, even more important than the technical characteristics of the supplier with whom a buying firm is collaborating.

Finally, this study investigated the moderating effect of a supplier's collaborative attitude on the supplier and relational characteristics (H7a, H7b, H7c, H8a, and H8b). The results show a positive moderating effect on supplier professionalism and supplier development programs. According to these results, supplier professionalism is exploited more easily when the supplier has a positive attitude towards collaboration. In addition, the results indicate that suppliers with a strong collaborative attitude are better able to utilize the buyer–supplier interface within development programs.

Although it was hypothesized that – similar to professionalism and development programs – a supplier's collaborative attitude would enable firms to better utilize the suppliers' specialization, the opposite was found to be true. Suppliers' collaborative attitude negatively moderates the effect of supplier specialization on innovative contribution. This negative interaction could possibly be explained by the fact that the specialization of the supplier might set clear boundaries between

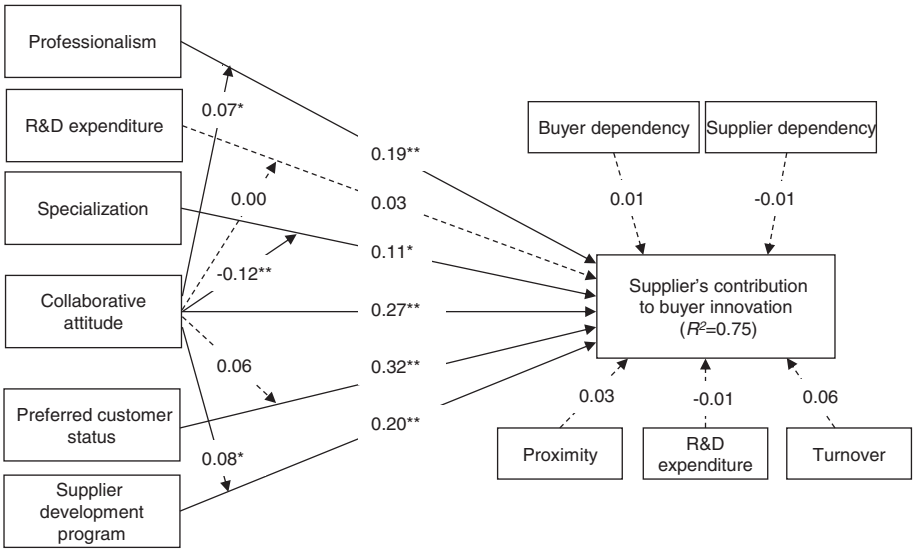

Fig. 2. Structural model, $^{*}p < 0.05$, $^{**}p < 0.01$, dashed arrows indicate non-significant relationships.

the buyer and the suppliers. Therefore, there might be relatively little overlap between the buyer and supplier, which was found to hamper collaboration in previous literature (Liker, Collins, & Hull, 1999). The negative moderation effect found in our study might therefore reflect the difficulties in the communication with highly specialized suppliers during innovation collaborations.

5.2. Theoretical contributions and managerial implications

This paper contributes to a better understanding of innovation in business networks. Whereas early IMP literature has explored innovation in buyer–supplier relationships (e.g., Håkansson & Snehota, 1995; Walter et al., 2001), this paper provides a clearer empirical evaluation of the nature of innovative suppliers that enables buying firms to better grasp potential innovation value from their supplier networks. By doing so, this paper contributes to the IMP literature on obtaining innovation value from business networks in several ways. First, although already suggested by several researchers this paper provides the first empirical test of the relationship between supplier professionalism and specialization, and buyer–supplier innovation contribution. Second, this study shows the importance of a supplier's collaborative attitude in buyer–supplier collaborations. This study thereby provides a more exhaustive picture than is given in much of the current sourcing literature (Ho et al., 2010) by showing that sourcing innovative suppliers is not merely a case of selecting suppliers with the "best" technical characteristics. Third, this study provides greater insight into the relational characteristics that influence buyer–supplier innovation performance. It shows how a preferred customer status and supplier development programs are important facilitators of innovation collaborations between buyers and suppliers. Because of the intense character of innovation collaborations, a supplier cannot dedicate its resources equally among buyers. As the results of this study indicate, buyers can target a supplier's most innovative resources by pursuing a preferred customer status.

Also on a managerial level, this study has several important implications. In current practice, often the supplier with the highest technical performance in a firm's network is sourced (Kannan & Tan, 2002). This study's results, however, suggest that the managerial decision-making framework for selecting the most innovative supplier should be extended to include the supplier's collaborative attitude and the relational aspects. If these aspects are taken into account, then a more complete picture emerges that allows managers to make better decisions with respect to sourcing suppliers with the highest expected innovation outcomes. Therefore, in selecting innovative suppliers, firms might want to move away from considering only "hard facts" on suppliers (e.g., R&D expenditures and certificates) and give more consideration to the relational aspects in the buyer–supplier dyad and to suppliers' collaborative attitudes. Firms might reevaluate their supplier network knowing that the 'best' supplier may not be the best supplier for their firm. This study showed that focusing on these relational aspects better enables managers to select suppliers that have a high likelihood of performing well in buyer–supplier innovations.

5.3. Limitations and future research

The findings of this study should be interpreted in the light of some limitations. Because the results of this study are based on subjective data the ratings may reflect the respondents' rationalization and sensemaking (Rong & Wilkinson, 2011). For example, an alternative explanation for the strong link between collaborative attitude and supplier contribution to buyer–supplier innovation, may be that if the supplier contributes to innovation, it is perceived to have a collaborative attitude. Future research should address this shortcoming by making use of objective data. Next to this, even though the results of this study support most of the hypotheses that are posed, it can be argued whether or not collaborative attitude is a cause or an effect of supplier contribution to innovation. Future research might take a longitudinal approach to address this shortcoming. Additionally, the dataset represents the buyer's perspective. The supplier's perspective might help to better understand the workings of the hypothetical supplier and relational characteristics. Therefore, examining the supplier perspective in the buyer–supplier relationship is a direction for future research. Furthermore, the findings on the relational characteristics are only applicable to suppliers within the current network of the buying firm. Consequently, an interesting question for future research is how firms can recognize innovative suppliers that are not within their current network.

Finally, this study showed how a buyer's preferred customer status has a positive effect on the supplier's contribution to the buying firm's innovations. However, what other benefits can be expected from being a preferred customer and how can buying firms become a preferred customer? Also, is it, for example, easier for larger firms to receive preferential treatment because they represent a higher potential share in turnover for the supplier compared to small and medium-sized companies? Addressing these types of questions in future research can lead to interesting insights into the role of the preferred customer construct.

Appendix A

A.1. Measures

Supplier contributions in buyer–supplier innovations (SIC, $\alpha = 0.90$)	
SIC1 (0.90)	The level of technological capability the supplier possesses and is willing to use for our products is high[a]
SIC2 (0.83)	The supplier is willing to share key technological information[a]
SIC3 (0.90)	This supplier is capable of supporting collaborative processes in product development and process improvement[a]
SIC4 (0.89)	This supplier is frequently proactive in approaching us with innovations[a]
Supplier professionalism (SP, $\alpha = 0.72$)	
SP1 (0.83)	The supplier obtained relevant quality certificates (e.g., ISO TS 16949 in the automotive industry)[a]
SP2 (0.93)	This supplier has well-developed project management capabilities[a]
Supplier's R&D expenditure (SRD)	
SRD1	Please indicate the magnitude of this supplier's R&D expenditure in relation to annual sales:[b]
Supplier specialization (SSP)	
SSP1	This supplier develops products exactly in line with our requirements. We are not just offered "standard solutions"[a]
SSP2	This unit of the supplier sells its products to many industries[a]*
SSP3	How many direct competitors does this supplier have?[c]
Supplier collaborative attitude (SCA, $\alpha = 0.66$)	
SCA1 (0.71)	This supplier is involved in several collaborative ventures, not only with our company[a]
SCA2 (0.86)	This supplier's management attaches importance to collaborative customer relationships[a]
SCA3 (0.74)	This supplier involves its sub-suppliers in its development process[a]
Preferred customer status (PCS, $\alpha = 0.90$)	
PCS1 (0.74)	This supplier has made sacrifices for us in the past[a]
PCS2 (0.90)	This supplier cares for us[a]
PCS3 (0.88)	In case of shortages, this supplier has gone out on a limb for us[a]
PCS4 (0.91)	We feel this supplier is on our side[a]
PCS5 (0.86)	The best resources of this supplier work for us[a]
Supplier development program (SDP, $\alpha = 0.77$)	
SDP1 (0.58)	We do a lot of things to continually improve this supplier[a]
	We have been collaborating with this supplier in the following areas:
SDP2 (0.84)	– product quality[a]
SDP3 (0.86)	– technical assistance[a]
SDP4 (0.78)	– innovation and improvement workshops[a]

[a]Item measured on five-point scale: 1 = fully disagree, 5 = fully agree.
[b]Item measured in percentage.
[c]Item was measured in integer.
*Item was reverse-scaled.

References

Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, *45*(3), 425–455.

Allred, C. R., Fawcett, S. E., Wallin, C., & Magnan, G. M. (2011). A dynamic collaboration capability as a source of competitive advantage. *Decision Sciences*, *42*(1), 129–161.

Andersen, P. H., & Christensen, P. R. (2000). Inter-partner learning in global supply chains: Lessons from NOVO Nordisk. *European Journal of Purchasing & Supply Management*, *6*(2), 105–116.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*(3), 396–402.

Azadegan, A., Dooley, K. J., Carter, P. L., & Carter, J. R. (2008). Supplier innovativeness and the role of interorganizational learning in enhancing manufacturer capabilities. *Journal of Supply Chain Management*, *44*(4), 14–35.

Baum, J. A.C., Calabrese, T., & Silverman, B.S. (2000). Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management Journal*, *21*(3), 267–294.

Beaumont, N., & Sohal, A. (2004). Outsourcing in Australia. *International Journal of Operations & Production Management*, *24*(7), 688–700.

Benner, M. J., & Tushman, M. L. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, *28*(2), 238–256.

Bidault, F., Despres, C., & Butler, C. (1998). The drivers of cooperation between buyers and suppliers for product innovation. *Research Policy*, *26*(7–8), 719–732.

Birkinshaw, J., Morrison, A., & Hulland, J. (1995). Structural and competitive determinants of a global integration strategy. *Strategic Management Journal*, *16*(8), 637–655.

Bosch-Sijtsema, P.M., & Postma, T. J. B.M. (2009). Cooperative innovation projects: Capabilities and governance mechanisms. *Journal of Product Innovation Management*, *26*(1), 58–70.

Briggs, E., Landry, T. D., & Daugherty, P. J. (2010). Investigating the influence of velocity performance on satisfaction with third party logistics service. *Industrial Marketing Management*, *39*(4), 640–649.

Cabral, J., & Traill, W. B. (2001). Determinants of a firm's likelihood to innovate and intensity of innovation in the Brazilian food industry. *Journal on Chain and Network Science*, *1*(1), 33–48.

Cagliano, R., Caniato, F., Corso, M., & Spina, G. (2005). Collaborative improvement in the extended manufacturing enterprise: Lessons from an action research process. *Production Planning and Control*, *16*(4), 345–355.

Cassiman, B., & Veugelers, R. (2006). In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition. *Management Science*, *52*(1), 68–82.

Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press.

Cohen, J. (2001). A power primer. *Psychological Bulletin*, *112*(1), 155–159.

Cormican, K., & O'Sullivan, D. (2004). Auditing best practice for effective product innovation management. *Technovation*, *24*(10), 819–829.

Corsaro, D., Ramos, C., Henneberg, S.C., & Naudé, P. (2012). The impact of network configurations on value constellations in business markets — The case of an innovation network. *Industrial Marketing Management*, *41*(1), 54–67.

Corsten, D., & Felde, J. (2005). Exploring the performance effects of key-supplier collaboration: An empirical investigation into Swiss buyer–supplier relationships. *International Journal of Physical Distribution & Logistics Management*, *35*(6), 445–461.

Croom, S. R. (2001). The dyadic capabilities concept: Examining the processes of key supplier involvement in collaborative product development. *European Journal of Purchasing & Supply Management*, *7*(1), 29–37.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, *34*(3), 555–590.

Deshpandé, R., Farley, J. U., & Webster, F. E. (1993). Corporate culture, customer orientation, and innovativeness in Japanese firms: A quadrad analysis. *Journal of Marketing*, *57*(January), 23–27.

Dyer, J. H. (1996). Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management Journal*, *17*(4), 271–291.

Dyer, J. H., & Hatch, N. W. (2006). Relation-specific capabilities and barriers to knowledge transfers: Creating advantage through network relationships. *Strategic Management Journal*, *27*(8), 701–719.

Ellegaard, C., Johansen, J., & Drejer, A. (2003). Managing industrial buyer–supplier relations — The case for attractiveness. *Integrated Manufacturing Systems*, *14*(4), 346–356.

Ellegaard, C., & Koch, C. (2012). The effects of low internal integration between purchasing and operations on suppliers' resource mobilization. *Journal of Purchasing and Supply Management*, *18*(3), 148–158.

Essig, M., & Amann, M. (2009). Supplier satisfaction: Conceptual basics and explorative findings. *Journal of Purchasing and Supply Management*, *15*(2), 103–113.

Ethiraj, S. K., Kale, P., Krishnan, M. S., & Singh, J. V. (2005). Where do capabilities come from and how do they matter? A study in the software services industry. *Strategic Management Journal*, *26*(1), 25–45.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(February), 39–50.

Freytag, P. V., Clarke, A. H., & Evald, M. R. (2012). Reconsidering outsourcing solutions. *European Management Journal*, *30*(2), 99–110.

Ganesan, S. (1994). Determinants of long-term orientation in buyer–seller relationships. *Journal of Marketing*, *58*(2), 1–19.

Griffith, R., Huergo, E., Mairesse, J., & Peters, B. (2006). Innovation and productivity across four European countries. *Oxford Review of Economic Policy*, *22*(4), 483–498.

Gulati, R., Nohria, N., & Zaheer, A. (2000). Strategic networks. *Strategic Management Journal*, *21*(3), 203–215.

Hair, J. F. J., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis*, *Vol. 3*, . New York: Macmillan.

Håkansson, H. (1987). *Industrial technological development: A network approach*. London: Croom Helm.

Håkansson, H., & Snehota, I. (1995). *Developing relationships in business networks*. London: Routledge.

Hansen, M. T. (2002). Knowledge networks: Explaining effective knowledge sharing in multiunit companies. *Organization Science*, *13*(3), 232–248.

Ho, W., Xu, X., & Dey, P. K. (2010). Multi-criteria decision making approaches for supplier evaluation and selection: A literature review. *European Journal of Operational Research*, *202*(1), 16–24.

Hoholm, T., & Olsen, P. I. (2012). The contrary forces of innovation: A conceptual model for studying networked innovation processes. *Industrial Marketing Management*, *41*(2), 344–356.

Hult, G. T. M. (1998). Managing the international strategic sourcing process as a market-driven organizational learning system. *Decision Sciences*, *29*(1), 193–216.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: An integration and empirical examination. *Journal of Marketing*, *62*(3), 52–54.

Hüttinger, L., Schiele, H., & Veldman, J. (2012). The drivers of customer attractiveness, supplier satisfaction and preferred customer status: A literature review. *Industrial Marketing Management*, *41*(8), 1194–1205.

Jarvis, Cheryl B., MacKenzie, Scott B., & Podsakoff, Philip M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, *30*(2), 199–218.

Kannan, V. R., & Tan, K. C. (2002). Supplier selection and assessment: Their impact on business performance. *Journal of Supply Chain Management*, *38*(4), 11–21.

Kaufman, A., Wood, C. H., & Theyel, G. (2000). Collaboration and technology linkages: A strategic supplier typology. *Strategic Management Journal*, *21*(6), 649–663.

Kocabasoglu, C., & Suresh, N. C. (2006). Strategic sourcing: An empirical investigation of the concept and its practices in U.S. manufacturing firms. *Journal of Supply Chain Management*, *42*(2), 4–16.

Krause, D. R. (1997). Supplier development: Current practices and outcomes. *Journal of Supply Chain Management*, *33*(2), 12–19.

Krause, D. R. (1999). The antecedents of buying firms' efforts to improve suppliers. *Journal of Operations Management*, *17*(2), 205–224.

Krause, D. R., Handfield, R. B., & Tyler, B. B. (2007). The relationships between supplier development, commitment, social capital accumulation and performance improvement. *Journal of Operations Management*, *25*(2), 528–545.

Krause, D. R., Pagell, M., & Curkovic, S. (2001). Toward a measure of competitive priorities for purchasing. *Journal of Operations Management*, *19*(4), 497–512.

Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, *27*(2), 131–150.

Lavie, D. (2007). Alliance portfolios and firm performance: A study of value creation and appropriation in the U.S. software industry. *Strategic Management Journal*, *28*(12), 1187–1212.

Legler, H., & Frietsch, R. (2007). *Neuabgrenzung der Wissenswirtschaft - Forschungsintensive Industrien und wissensintensive Dienstleistungen (NIW/ISI Listen 2006)*.

Li, W., Humphreys, P. K., Yeung, A.C. L., & Edwin Cheng, T. C. (2007). The impact of specific supplier development efforts on buyer competitive advantage: An empirical model. *International Journal of Production Economics*, *106*(1), 230–247.

Liker, J. K., Collins, P. D., & Hull, F. M. (1999). Flexibility and standardization: Test of a contingency model of product design–manufacturing integration. *Journal of Product Innovation Management*, *16*(3), 248–267.

Liker, J. K., Kamath, R. R., Nazli Wasti, S., & Nagamachi, M. (1996). Supplier involvement in automotive component design: Are there really large US Japan differences? *Research Policy*, *25*(1), 59–89.

Lockström, M., Schadel, J., Harrison, N., Moser, R., & Malhotra, M. K. (2010). Antecedents to supplier integration in the automotive industry: A multiple-case study of foreign subsidiaries in China. *Journal of Operations Management*, *28*(3), 240–256.

MacCallum, R. C., & Browne, M. W. (1993). The use of causal indicators in covariance structure models: Some practical issues. *Psychological Bulletin*, *114*(3), 119–136.

Miles, J., & Shevlin, M. (2001). *Applying regression and correlation*. London: Sage Publications.

Mishra, A. A., & Shah, R. (2009). In union lies strength: Collaborative competence in new product development and its performance effects. *Journal of Operations Management*, *27*(4), 324–338.

Mitsuhashi, H., & Greve, H. R. (2009). A matching theory of alliance formation and organizational success: Complementarity and compatibility. *Academy of Management Journal*, *52*(5), 975–995.

Mooi, E. A., & Frambach, R. T. (2012). Encouraging innovation in business relationships — A research note. *Journal of Business Research*, *65*(7), 1025–1030.

Moran, P. (2005). Structural vs. relational embeddedness: Social capital and managerial performance. *Strategic Management Journal*, *26*(12), 1129–1151.

Moultrie, J., Clarkson, P. J., & Probert, D. (2007). Development of a design audit tool for SMEs. *Journal of Product Innovation Management*, *24*(4), 335–368.

Mouzas, S., & Ford, D. (2009). The constitution of networks. *Industrial Marketing Management*, *38*(5), 495–503.

Naveh, E. (2007). Formality and discretion in successful R&D projects. *Journal of Operations Management*, *25*(1), 110–125.

Nunnally, J. C. (1978). *Psychometric theory*, *Vol. 2*, . New York: McGraw-Hill.

O'Brien, R. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, *41*(5), 673–690.

Park, D., & Krishnan, H. A. (2001). Supplier selection practices among small firms in the united states: Testing three models. *Journal of Small Business Management*, *39*(3), 259–271.

Petroni, A., & Panciroli, B. (2002). Innovation as a determinant of suppliers' roles and performances: An empirical study in the food machinery industry. *European Journal of Purchasing & Supply Management*, *8*(3), 135–149.
Podsakoff, P.M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531–544.
Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, *41*(1), 116–145.
Pulles, N. J., & Schiele, H. (2013). Social capital determinants of preferential resource allocation in regional clusters. *Management Revue*, *24*(2), 96–113.
Ragatz, G. L., Handfield, R. B., & Petersen, K. J. (2002). Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *Journal of Business Research*, *55*(5), 389–400.
Ramsay, J., & Wagner, B.A. (2009). Organisational supplying behaviour: Understanding supplier needs, wants and preferences. *Journal of Purchasing and Supply Management*, *15*(2), 127–138.
Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. *International Journal of Research in Marketing*, *26*(4), 332–344.
Rese, M. (2006). Successful and sustainable business partnerships: How to select the right partners. *Industrial Marketing Management*, *35*(1), 72–82.
Ridley, M. (2010). *The rational optimist: How prosperity evolves*. New York: HarperCollins.
Ringle, C. M., Wende, S., & Will, A. (2005). *SmartPLS 2.0*. Hamburg: University of Hamburg.
Ritter, T., Wilkinson, I. F., & Johnston, W. J. (2004). Managing in complex business networks. *Industrial Marketing Management*, *33*(3), 175–183.
Romer, P.M. (1990). Endogenous technological change. *The Journal of Political Economy*, *98*(5), 71–102.
Rong, B., & Wilkinson, I. F. (2011). What do managers' survey responses mean and what affects them? The case of market orientation and firm performance. *Australasian Marketing Journal; AMJ*, *19*(3), 137–147.
Roy, S., Sivakumar, K., & Wilkinson, I. F. (2004). Innovation generation in supply chain relationships: A conceptual model and research propositions. *Journal of the Academy of Marketing Science*, *32*(1), 61–79.
Salomo, S., Weise, J., & Gemünden, H. G. (2007). NPD planning activities and innovation performance: The mediating role of process management and the moderating effect of product innovativeness. *Journal of Product Innovation Management*, *24*(4), 285–302.
Schiele, H. (2006). How to distinguish innovative suppliers? Identifying innovative suppliers as new task for purchasing. *Industrial Marketing Management*, *35*(8), 925–935.
Schiele, H., Veldman, J., Hüttinger, L., & Pulles, N. (2012). Towards a social exchange theory perspective on preferred customership — Concept and practice. In R. Bogaschewsky, M. Eßig, R. Lasch, & W. Stölzle (Eds.), *Supply management research* (pp. 133–151). Gabler Verlag.
Scott-Young, C., & Samson, D. (2008). Project success and project team management: Evidence from capital projects in the process industries. *Journal of Operations Management*, *26*(6), 749–766.
Song, M., & Di Benedetto, C. A. (2008). Supplier's involvement and success of radical new product development in new ventures. *Journal of Operations Management*, *26*(1), 1–22.
Soosay, C. A., Hyland, P. W., & Ferrer, M. (2008). Supply chain collaboration: Capabilities for continuous innovation. *Supply Chain Management: An International Journal*, *13*(2), 160–169.
Spekman, R. E., & Carraway, R. (2006). Making the transition to collaborative buyer–seller relationships: An emerging framework. *Industrial Marketing Management*, *35*(1), 10–19.
Takeishi, A. (2001). Bridging inter- and intra-firm boundaries: Management of supplier involvement in automobile product development. *Strategic Management Journal*, *22*(5), 403–433.
Thomke, S. H., & Von Hippel, E. (2002). Customers as innovators: A new way to create value. *Harvard Business Review*, *80*(4), 74–81.
Trent, R. J., & Monczka, R. M. (1999). Achieving world-class supplier quality. *Total Quality Management*, *10*(6), 927–938.
Ulaga, W., & Eggert, A. (2006). Value-based differentiation in business relationships: Gaining and sustaining key supplier status. *Journal of Marketing*, *70*(1), 119–136.
von Corswant, F., & Tunälv, C. (2002). Coordinating customers and proactive suppliers: A case study of supplier collaboration in product development. *Journal of Engineering and Technology Management*, *19*(3–4), 249–261.
von Hippel, E. (1988). *The sources of innovation*. New York: Oxford University Press.
Wakelin, K. (2001). Productivity growth and R&D expenditure in UK manufacturing firms. *Research Policy*, *30*(7), 1079–1090.
Walter, A. (1999). Relationship promoters: Driving forces for successful customer relationships. *Industrial Marketing Management*, *28*(5), 537–551.
Walter, A., Ritter, T., & Gemünden, H. G. (2001). Value creation in buyer–seller relations: Theoretical considerations and empirical results from a supplier's perspective. *Industrial Marketing Management*, *30*(4), 365–377.
Wasti, S. N., & Liker, J. K. (1999). Collaborating with suppliers in product development: A US and Japan comparative study. *IEEE Transactions on Engineering Management*, *46*(4), 444–460.
Welch, C., & Wilkinson, I. (2002). Idea logics and network theory in business marketing. *Journal of Business-to-Business Marketing*, *9*(3), 27–48.
Wilkinson, I., & Young, L. (2002). On cooperating: Firms, relations and networks. *Journal of Business Research*, *55*(2), 123–132.
Wognum, P.M., Fisscher, O. A.M., & Weenink, S. A. J. (2002). Balanced relationships: Management of client–supplier relationships in product development. *Technovation*, *22*(6), 341–351.
Wynstra, F., Von Corswant, F., & Wetzels, M. (2010). In chains? An empirical study of antecedents of supplier product development activity in the automotive industry. *Journal of Product Innovation Management*, *27*(5), 625–639.
Young, L., Wiley, J., & Wilkinson, I. (2009). A comparison of European and Chinese supplier and customer functions and the impact of connected relations. *Journal of Business & Industrial Marketing*, *24*(1), 35–45.
Zsidisin, G. A., & Smith, M. E. (2005). Managing supply risk with early supplier involvement: A case study and research propositions. *Journal of Supply Chain Management*, *41*(4), 44–57.

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