

Supplier involvement by SMEs:

The effects of knowledge sharing on SME innovation project performance

Authors: Dirk Bothof¹ Arjan van Weele²

Summary: Innovation at SMEs is different from innovation at multinational companies (MNCs). SMEs lack a separate R&D department. As such SMEs need to rely on other sources, such as suppliers for new product and process innovation. Our research investigates how supplier involvement affects SME innovation performance. Based upon a coherent research framework derived from contemporary literature hypotheses on supplier involvement and SME innovation performance are formulated and tested through a small scale, exploratory survey. Our research shows that suppliers indeed play an important role in a significant number of SMEs' innovation projects. Moreover, we have found an interesting trade-off between supplier involvement and financial performance and quality on one hand and planning on the other hand.

Keywords: supplier involvement, SME, knowledge sharing, innovation

Submission category: Working paper

Introduction

The most important resource that is to be gained and captured in today's economy is knowledge. Suppliers have been widely acknowledged to be able to contribute valuable knowledge to innovation projects. Hence, companies try to leverage this potential by involving suppliers in their new product development processes (Johnsen, 2009). However, the current supplier involvement literature has been largely written from the perspective of the large multinational companies (hereafter: MNCs) (Johnsen, 2009), neglecting the perspective of small and medium-sized enterprises (hereafter: SMEs). The way SMEs do business is significantly different from MNCs. For instance, SMEs tend to rely more on interpersonal relationships in dealing with suppliers (Ellegaard, 2006). In recent years research on SMEs has gained recognition by academics. Despite the interest in SMEs in general, the literature on purchasing by SMEs is still limited in both purchasing and SME oriented journals (Ellegaard, 2006). The current purchasing literature "seems to be from and for larger companies" (Mumdambi & Schröder, 1996, p. 122). Johnsen (2009) came to a similar conclusion after reviewing the supplier involvement literature; "most research to date has adopted the perspective of large powerful manufacturers" (Johnson, 2009, p. 195). Moreover, Mumdambi & Schüder (1996) concluded that the results of partnership-related studies conducted at larger firms are almost impossible to transfer to a SME setting. Therefore, the relevance of the current supplier involvement literature for SMEs is highly questionable. Nevertheless, "SMEs stand to gain considerably from drawing on external resources such as suppliers" (Pressey, Winklhofer, & Tzokas, 2009 p. 215).

The potential benefits of supplier involvement for SMEs and the lack of academic research creates an interesting research opportunity. This research aims at explaining innovation through early supplier involvement at SMEs in The Netherlands in different industries.

¹ Eindhoven University of Technology, School of Industrial Engineering, Department ITEM, Willem Klooslaan 15, 5615 NK Eindhoven, email: dirkbothof@hotmail.com

² Eindhoven University of Technology, School of Industrial Engineering, Department ITEM, PO Box 513, 5600 MB Eindhoven, email: a.j.v.weele@tue.nl

This paper is structured in the following manner; first, the theoretical background is explained. Next, the research framework is presented. Third, we present our research findings. After which conclusions will be drawn based on the results of the analysis. The last part of this paper will elaborate on the limitations and directions for future research.

Theoretical background

Differences between SME and MNC

SMEs are distinctively different from MNCs in the way they do business. With respect to purchasing the most prevalent factors are:

- Low formalization of the purchasing process (e.g. Pearson & Ellram, 1995)
- Close personal relationships with suppliers (e.g. Ellegaard, 2006)
- Limited purchasing power (e.g. Quayle, 2002)

Several researchers found that the formalization of the purchasing process in SMEs is generally low (Ellegaard, 2006; 2009; Pearson & Ellram, 1995; Pressey et al., 2009). However, this does not mean that SMEs are 'bad' purchasers. On the contrary, "empirical evidence suggests that small company owners perform well as purchasers" (Ellegaard, 2006, p. 280). In addition, Pearson & Ellram (1995) argue that the minimal formalization of purchasing does not imply shortage of management sophistication. Pressey et al. (2009) reported similar results. They argue that SMEs tend to invest in developing personalized informal relationships with suppliers. The low formalization of purchasing is in line with earlier findings of Larson (1992) and Weaver & Dickson (1998) that SMEs rarely use formalized contracts in a dyadic relation.

Relationships between SMEs and their suppliers, compared to MNCs, seem less formal and more personal. Handfield & Bechtel (2002) found trust to have a significant effect on supplier responsiveness. Supplier responsiveness was defined "as the supplier's ability to quickly respond to the buying party's needs" (Handfield & Bechtel, 2002, p. 367). Buyer dependence (i.e. power) was found to have a significant negative impact on supplier responsiveness. In this research we postulate SME-trust to affect supplier responsiveness. This is in line with Morrissey & Pittaway (2006, p.277) , who stated: "In the absence of power, trust offers the SME an alternative for managing interfirm relationships, especially in their relationships with suppliers".

Innovation by SMEs

The classical Schumpeterian debate about the relation between firm size and innovative capabilities has been extensively researched both at a conceptual and empirical level. Notwithstanding there seems little consensus among researchers on how firm size affects innovative capability. Given the scope of our research a we do not provide a detailed review of this debate . We focus our discussion on the key characteristics of SME innovation. Next, we will present our research framework.

Traditionally SMEs have been viewed as having better internal conditions to stimulate innovation, in terms of rapid response to changing market conditions and flexibility (e.g. Nooteboom, 1994). The advantage of larger firms resides in their relatively strong resource position. Furthermore, MNCs have economies of scale and scope allowing them to spread the fixed cost of innovation over a larger customer base, lowering the relative cost of innovation (Rogers, 2004). The strengths of larger firms make them better equipped for innovation projects that require capital expensive equipment of large specialized project teams (Nieto &

Santamaría, 2010). On the other hand, SMEs seem better at developing small scale applications for niche markets due to the flexibility and ability to rapidly respond to market signals (Nooteboom, 1994). Additionally, SMEs have been found to be more focused on product innovation than process innovation (Verhees & Meulenber, 2004; Nieto & Santamaría, 2010). Verhees & Meulenber (2004) argue that process innovations are less saleable than product innovations and therefore less attractive for SMEs.

The results of the study by Nieto & Santamaría (2010) clearly show that MNCs, compared to SMEs, seem more capable of bringing innovations to the market. However, when only considering vertically collaborating firms (i.e. collaborations among customers or suppliers), SMEs have almost the same level of product innovation as MNCs. Process innovations seem still dominated by MNCs. Nevertheless vertically collaborating SMEs deliver significantly more process innovations than SMEs that do not engage in vertical collaborations.

Research framework

Our proposed research framework is aimed at explaining SME innovation performance through early supplier involvement at the project level. An innovation project is defined as: a project in which a new product, solution or process was developed or applied successfully. Innovation performance indicators (planning/timely completion, financial performance, and quality) are explained through the level of actual knowledge sharing with suppliers. Effects of knowledge sharing on innovation performance are moderated by the phase of supplier involvement.

The level of knowledge sharing is explained by the extent of supplier involvement. In other words, supplier involvement is hypothesized to create a coordination mechanism through which specific product- and/or process-knowledge is shared. Supplier involvement originates from the relationship with the supplier. This is graphically represented in figure 1 below. Both the dependent and independent variables are measured using constructs and items from previous research.

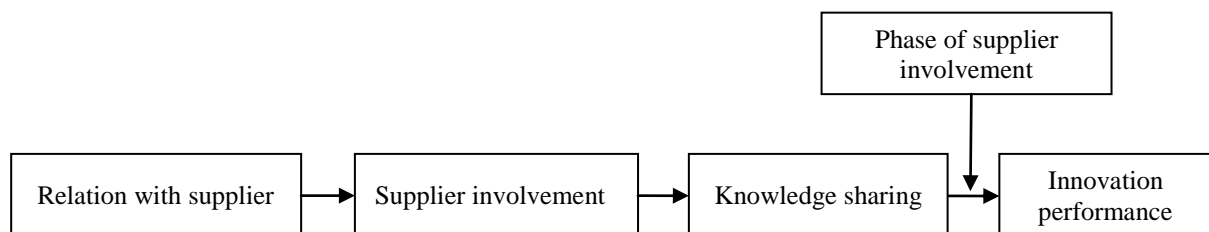


Figure 1, basic research framework

Our research framework assumes a positive effect between supplier relationship and supplier involvement. As stated earlier, previous research suggests that SMEs tend to have close personal relationships with their suppliers (e.g. Ellegaard, 2006). Morrissey & Pittaway (2006) state that trust, instead of power, seem to offer SMEs a method of managing the relationship with suppliers. In our research framework supplier relationship is measured using the following constructs: contractual specificity, trust, and length of the relationship. Following previous research, we differentiated between four types of supplier involvement with increased responsibility for the supplier; none, white box, grey box and black box responsibility (Petersen, Handfield, & Ragatz, 2005). White box refers to the informal consultation of suppliers on the buyers design, grey box refers to joint development activity between buyer and supplier, and black box refers to a supplier driven development.

The research model assumes that supplier involvement is correlated with knowledge sharing. Here, a distinction was made between explorative and exploitative knowledge sharing (He & Wong, 2004). Explorative knowledge sharing is focused on realizing cost savings and breakthrough innovation on the long term, whilst exploitative knowledge sharing is focused on capturing benefits from incremental product and process improvements.

Lastly, phase of supplier involvement is assumed to moderate the effect of knowledge sharing on innovation performance. Here we argue that earlier supplier involvement leads to a larger impact of knowledge sharing on innovation performance. This because changing the specification at the beginning of an innovation project is hypothesized to have a larger impact on cost savings than supplier involvement at a later stage.

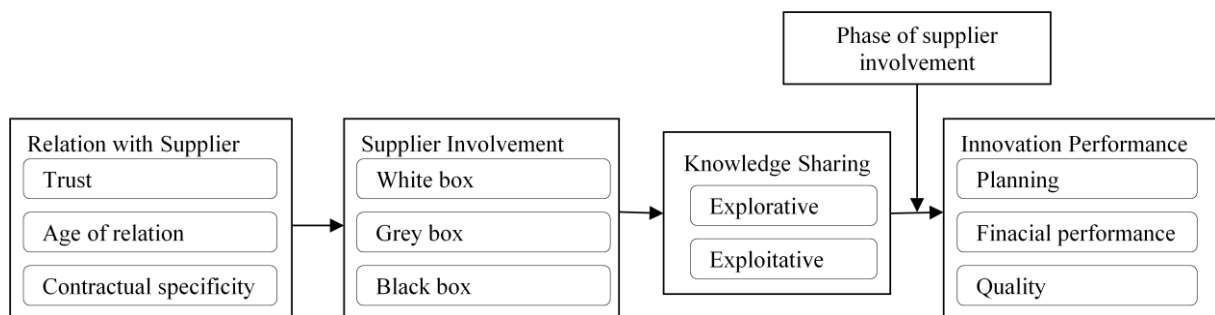


Figure 2, research framework

Analysis

The analysis of the research framework is based on the responses of SMEs to an online questionnaire. In total the survey has been send out to 319 potential respondents. This resulted in 53 responses (16,6% response rate), of which one response was discarded due to the amount of missing values. These responses have been gathered with the help of three network organizations, namely Inka Purchasing Association (14 respondents), Association of Metal Windows and Facade Structures (28 respondents), and the Biotech Systems Platform (10 respondents). Of the respondents 37 had completed an innovation project and in 27 of these projects suppliers were involved.

A Kruskal-Wallis test was performed, using IBM SPSS Statistics 22, to test if the innovation performance of the projects that involved suppliers in the innovation project were significantly different from the respondents that did not involve suppliers during the innovation project. The Kruskal-Wallis test was non-significant for all four innovation performance indicators. Thus, the innovation performance of the projects in which suppliers were involved was not significantly different from projects in which no suppliers were involved. Nevertheless, of the 27 respondents that involved suppliers, 15 respondents perceived that the innovation project could not have been completed without the involvement of suppliers.

The research framework was analyzed with PLS-SEM using the SmartPLS software and the guidelines of Hair, Hult, Ringle, and Sarstedt (2014). The analysis of the research framework was based on the 27 cases that involved suppliers during the innovation project. The results of the analysis are shown in table 1 and table 2 (on the next page).

Construct	R ² _{Adjusted}	Q ²
White box	-0,015	-0,056
Grey Box	0,212	0,156
Black Box	0,190	0,108
Exploitative knoweldge sharing	0,524	0,370
Explorative knowledge sharing	0,526	0,332
Finacial results	0,425	0,433
Planning	0,308	0,248
Quality	0,475	0,400

Table 1, explained variance of the constructs and predictive relavance

Relation	Path coefficient	p-value	f ²
Age of rel. <-> White box	-0,005	0,965	0,000
Age of rel. <-> Grey box	0,258	0,092	0,091
Age of rel. <-> Black box	0,333	0,036	0,147
Trust <-> White box	0,184	0,176	0,037
Trust <-> Grey box	0,338	0,033	0,159
Trust <-> Black box	0,372	0,032	0,189
Contractual specificity <->White box	-0,275	0,112	0,081
Contractual specificity <->Grey box	0,247	0,116	0,085
Contractual specificity <->Black box	-0,020	0,873	0,001
White box <-> Exploitative knowledge sharing	0,204	0,137	0,084
White box <-> Explorative knowledge sharing	0,079	0,492	0,013
Grey box <-> Exploitative knowledge sharing	0,196	0,347	0,053
Grey box <-> Explorative knowledge sharing	0,536	0,032	0,401
Black box <-> Exploitative knowledge sharing	0,540	0,016	0,364
Black box <-> Explorative knowledge sharing	0,283	0,145	0,100
Exploitative knowledge sharing <-> Financial performance	0,604	0,047	0,364
Explorative knowledge sharing <-> Financial performance	0,108	0,607	0,009
Exploitative knowledge sharing <-> Planning	0,877	0,001	0,531
Explorative knowledge sharing <-> Planning	-0,507	0,044	0,177
Exploitative knowledge sharing <-> Quality	0,451	0,028	0,185
Explorative knowledge sharing <-> Quality	0,315	0,098	0,090

Table 2, path coefficients and significance

In the PLS-SEM model a moderation analysis did not reveal significant effects between phase of supplier involvement en the relationship between knowledge sharing and any of the innovation performance indicators.

To gain deeper insight into how explorative knowledge sharing, exploitative knowledge sharing, and the combination of the two influence the innovation performance variables, a polynomial regression equation (Edwards & Parry, 1993) was created upon which a response surface analysis was performed. This analysis was performed following the guidelines of Shanock, Baran, Gentry, Pattison, & Heggstad (2010). Two significant slopes were found resulting in the conclusion that financial performance and quality are merely to be increased through explorative and exploitative knowledge sharing. A third slope ($p=0,087$), concerning

planning, explained that planning seems only to be improved through exploitative knowledge sharing, whilst explorative knowledge sharing seems to affect planning negatively.

Results

This research has shown that 15 out of the 37 (40%) surveyed SMEs that completed an innovation project perceived the contribution of suppliers as mandatory to complete the innovation project. Apparently, the resources that suppliers add to an SME innovation project seem to be of vital importance for the completion of an SME innovation project. This might explain the relatively high number of cases of supplier involvement. Some of the SMEs might have no real choice but to involve suppliers in their innovation project if they want to complete the innovation project at all. These suppliers might contribute necessary resources to the innovation project that complement or supplement the resources available within the firm. Moreover, this suggests that the role of suppliers might be more important than merely increasing the innovation performance during an innovation project of an SME.

Our research shows that trusting and longer term relationships do correlate with those types of supplier involvement that give more responsibility to the involved supplier in the innovation project. With respect to these effects trust seems to be more important than age i.e. duration of the relationship. Our research found that contracts were used in all but three cases of supplier involvement. Nevertheless, contract specificity seems to have a low impact on supplier involvement. Contracts might serve alternative functions like demonstrating commitment. Our findings support the view that personal relationships are an important driver of effective SME-supplier relationships, especially when it is desired to allocate more responsibility to a supplier in an innovation project.

Furthermore, we have found that supplier involvement indeed affects knowledge sharing. However, different types of knowledge sharing are correlated with different types of supplier involvement. White box supplier involvement, surprisingly, does not seem to be significantly correlated to knowledge sharing. Based upon our research, grey box supplier involvement seems to result in predominantly explorative knowledge sharing. Whereas black box supplier involvement seems to correlate significantly with exploitative knowledge sharing.

Knowledge sharing, in turn, seems to have a positive impact on SME innovation project performance. Interestingly, this study has revealed the need for both explorative and exploitative knowledge sharing in order to maximize the financial performance and quality of an SME innovation project. Nevertheless, a negative effect of explorative knowledge sharing on planning was found, creating a trade-off between planning i.e. time to market on the one hand and quality and financial performance of the SME innovation project on the other hand. Here, it seems that SMEs need to make a decision about the purpose for supplier involvement as different kinds of knowledge sharing will result in different innovation outcomes.

Limitations and future research

The presented study holds promising results and a fresh perspective for future supplier involvement research but also has some limitations. The testing of our research framework was conducted with a smaller than desired sample size. Nevertheless, the case will be made that this is not insurmountable. Hair, Black, Babin, & Anderson (2010) identified two problems with small samples; too little statistical power and overfitting (i.e. results are statistically significant for the sample, but not when investigating another sample).

The first possible issue, statistical power, is partially overcome by the used statistical method. PLS-SEM has been found to be a good choice when the sample size is small (Hair et al., 2014). Moreover, significant effects were found among numerous variables. Nevertheless, smaller effects in the research framework might turn out to have a significant impact when a larger sample size is investigated.

The second possible issue is generalizability, because of the small sample size one could be concerned that the effects that were found to be significant are only significant for the specific sample (i.e. overfitting). In the presented research this problem is partially overcome through the heterogeneity of the investigated sample. The heterogeneity mainly stems from the fact that the survey was conducted among three different supplier networks that represent different kinds of companies in different industries. Since the data did not originate from one industry the data is more diverse. Thus, the chance of overfitting is reduced. Nevertheless, caution is required when generalizing the results of this research, especially outside of the investigated network organisations.

Moreover, our research model does not capture the antecedents or consequences of white box supplier involvement in the context of supplier involvement by SMEs (the finding that white box supplier involvement has no or very limited effects might be correct). This is a clear limitation of the research, since there is a chance that not the entire spectrum of supplier involvement was captured. Nevertheless, this limitation simultaneously provides an interesting avenue for future research, especially since the majority of the respondents reported the application of white box supplier involvement.

Our research provides numerous leads for future research. Here, we will briefly mention three ideas. The first future research opportunity is extending the research framework to include the effect of explorative knowledge sharing on firm performance. More generally, it could be interesting, when doing so, to use a longitudinal research design instead of a cross-sectional research design. Another interesting direction for future research could be to include the balance of power between buyer and supplier. Third interesting avenue for future research could be to investigate the strategic need to involve suppliers in an innovation project, as this could create a more in-depth view on why SMEs involve suppliers.

References

- Edwards, J. R., & Parry, M. E. (1993). On the Use of Polynomial Regression Equations as an Alternative to Difference Scores in Organizational Research. *The Academy of Management Journal*, 36 (6), 1577-1613.
- Ellegaard, C. (2006). Small company purchasing: A research agenda. *Journal of Purchasing and Supply Management* (12), 272-283.
- Freel, M. (2000). External linkages and product innovation in small manufacturing firms. *Entrepreneurship & Regional Development: An International Journal*, 245-266.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Pearson Education.
- Hair, J. F., Hult, G. T., Ringle, C. M., & Sarstedt, M. (2014). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. SAGE Publications.
- Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management*, 31, 367-382.
- He, Z.-L., & Wong, P.-K. (2004). Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organization Science*, 15 (4), 481-494.

- Johnsen, T. E. (2009). Supplier involvement in new product development and innovation: Taking stock and looking at the future. *Journal of Purchasing & Supply Management* , 187-197.
- Larson, A. (1992). Network Dyads in Entrepreneurial Settings: A Study of the Governance of Exchange Relationships. *Administrative Science Quarterly* , 37 (1), 76-104.
- Morrissey, W. J., & Pittaway, L. (2006). Buyer-Supplier Relationships in Small Firms: The Use of Social Factors to Manage Relationships. *International Small Business Journal* , 24 (3), 272-298.
- Mumdambi, R., & Schröder, C. P. (1996). Progress towards buyer-supplier partnerships. *European Journal of Purchasing & supply Management* , 119-127.
- Nieto, M. J., & Santamaría, L. (2010). Technological Collaboration: Bridging the Innovation Gap between Small and Large Firms*. *Journal for Small Business Management* , 44-69.
- Nooteboom, B. (1994). Innovation and Diffusion in Small Firms: Theory and Evidence. *Small Business Economics* , 327-347.
- Pearson, J. N., & Ellram, L. M. (1995). Supplier selection and evaluation in small versus large electronics firms. *Journal of Small Business Management* , 33 (4), 53-66.
- Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2005). Supplier integration into new product development: coordinating product, process and supply chain design. *Journal of Operations Management* , 371-388.
- Pressey, A. D., Winklhofer, H. M., & Tzokas, N. X. (2009). Purchasing practices in small-to medium-sized enterprises: An examination of strategic purchasing adoption, supplier evaluation and supplier capabilities. *Journal of Purchasing & Supply Management* , 214-226.
- Quayle, M. (2002). Purchasing in small firms. *European Journal of Purchasing & Supply Management* , 151-156.
- Shanock, L. R., Baran, B. E., Gentry, W. A., Pattison, S. C., & Heggestad, E. D. (2010). Polynomial Regression with Response Surface Analysis: A Powerful Approach for Examining Moderation and Overcoming Limitations of Difference Scores. *Journal of Business and Psychology* , 25, 543-554.
- Verhees, F. J., & Meulenbergh, M. T. (2004). Market Orientation, Innovativeness, Product Innovation, and Performance in Small Firms. *Journal of Small Business Management* , 42 (2), 134-154.
- Weaver, K. M., & Dickson, P. H. (1998). Outcome Quality of Small- to Medium sized Enterprise-based Alliances: The Role of Perceived Partner Behavior. *Journal of Business Venturing* (13), 505-522.