
The impact of networking practices on small firm innovativeness and performance: a multivariate approach

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Abstract: Innovation is a complex process and this is especially true in the context of small firms. Therefore, networking has been suggested as a feasible strategy to achieve innovation. Although networking as such is multidimensional, the current paper focuses on two key aspects – Networking Capability (NC) and network configuration. Our main purpose is to examine how both these variables influence small firm innovativeness and firm performance. Empirically, we draw on data from 291 technology-based small Swedish firms. The results reveal that network configuration positively influences firm innovativeness, whereas NC has a strong positive impact on firm innovativeness and firm performance.

Keywords: NC; networking capability; network configuration; small firms; innovativeness; performance.

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1 Introduction

Fierce global competition requires firms to innovate continuously if they are to survive and prosper in the long term (Griffiths-Hemans and Grover, 2006). Specific examples of global competition include lower economic barriers and new and rapidly advancing technologies, which change the context of doing business and, therefore, force firms to find alternative practices to improve their competitiveness (Frishammar and Andersson, 2009; Rodrigues et al., 2007). In this context, innovation can be considered as a strategic activity, contributing significantly to firms' growth and prosperity (Koufteros et al., 2005). However, the average success rate of such innovative initiatives tends to be relatively low due to the high risk and complexity involved in the innovation process (Cooper et al., 2003). This situation is even more critical for small firms because they typically face issues in innovation related to insufficient funds and competences (Grando and Belvedere, 2006), informal and less structured processes, limited management competencies, and less specialised labour (De Toni and Nassimbeni, 2003).

According to the European Commission (2006), more than 90% of all active firms in the European Union can be classified as small firms. Thus, securing and understanding possible ways to help them to increase innovativeness is a topic of interest. Even when these facts are well established, the current literature is heavily biased towards larger firms. As small firms do not typically have large Research and Development (R&D)

units, specific development strategies, or well-established technological capabilities, previous empirical studies have limited value in the current context (Pittaway et al., 2004). In this study, we address this gap by focusing on specific practices that can facilitate small firm innovativeness and performance. A feasible avenue for resolving the complexity surrounding small firms' innovativeness is linked to networking practices, i.e., searching for partners with appropriate resources and capabilities for overcoming internal limitations. Such a strategy allows small firms to share the risks and costs inherent in the innovation process (Calia et al., 2007; Ragatz et al., 2002).

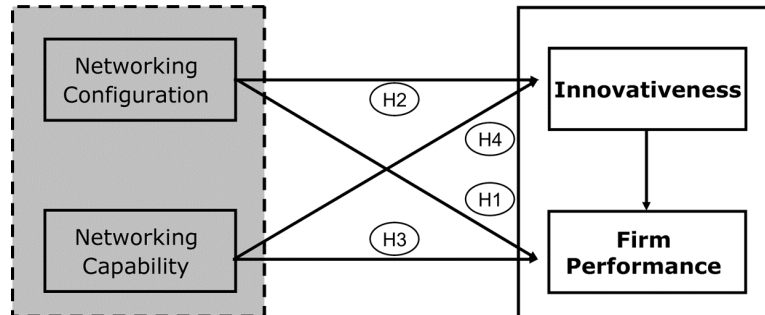
Although previous research on small firms has emphasised the importance of networking for innovativeness (Calia et al., 2007; Powell et al., 1996; Ragatz et al., 2002), it is less clear about which forms of networks (customer, supplier) or actors might hold the greatest value for small firm innovativeness, or how these network relations can be effectively utilised. Recognising these issues, this study highlights two important networking practices as antecedents to small firms' innovativeness and performance: *network configuration* and *NC*. We define network configuration as the pattern of relationships that is engendered from the direct and indirect ties between actors (Hoang and Antoncic, 2003), and NC as firms' ability to utilise inter-organisational relationships to gain access to various resources held by other actors (Walter et al., 2006).

The purpose of this paper is to examine whether network configuration and NC influence small firms' innovativeness and firm performance. The present study is unique as it includes NC and network configuration, which are two important variables derived from network-based literature that have a potentially strong influence on small firm innovativeness and performance. Thus, this paper contributes to the growing body of network literature (Borgatti and Foster, 2003). Besides, the focus on NC ties in with the growing body of literature on organisational capabilities. The capabilities-based view propagates the importance of firm capabilities as antecedents to competitive advantage (Teece et al., 1997; Walter et al., 2006). Finally, we also attempt to advance the literature on small firm innovation, which has been neglected in the past (Bougrain and Haudeville, 2002; Hörte et al., 2008).

The rest of the paper is divided into five sections. The first one presents the conceptual background that allows the enactment of a conceptual model and hypothesis. The second section elaborates upon the methodological considerations such as the research strategy, data collection, measurement issues, and data analysis. Next, we present the main results. The paper concludes with a discussion of the main findings, scope for future research, and managerial implications.

2 Conceptual background and literature review

In order to illustrate the hypothesised relationships between networking practices and small firms' innovativeness and performance, we propose the following conceptual model (see Figure 1). The model hypothesises relationships among network configuration, NC, innovativeness, and firm performance by drawing on relevant literature from several different theoretical domains.

Figure 1 Conceptual model and hypotheses for the relationship among networking practices and small firm innovativeness and performance

2.1 *Small firm innovativeness and performance*

Firm performance is the final dependent variable of this study. According to Cooper (1995), previous measurements of small firm performance have not been well defined. This problem is addressed in this study by considering small firm performance from different perspectives related to growth, financial gains, and customer orientation. According to Wiklund (1999), financial and growth-related measures of performance have been widely used in previous studies as they tend to be fairly precise and easy to assess. Customer satisfaction and loyalty are significant examples of customer-oriented aspects.

Firm innovativeness has been widely recognised as an important antecedent of firm performance. We define innovativeness as firms' ability to "introduce new products to the market, or opening up new markets, through combining strategic orientation with innovative behaviour and process" (Wang and Ahmed, 2004, p.304). We adopt this definition because it takes into account different innovation aspects that have been neglected in previous studies (Sethi et al., 2001). Together, these aspects cover the concept of innovativeness; they are the product dimension, process dimension, market dimension, strategic dimension, and behavioural dimension. Product innovation has been recognised to a great extent as part of innovativeness. The development of unique and original products helps firms to attract customers and satisfy their needs. Process innovation is related to the use of new methods or approaches that will allow firms to exploit their resources and capabilities effectively and efficiently. Market innovation includes the use of a marketing strategy or campaign to promote existing products, and the entrance into new markets or the identification of a niche for the product. The strategic dimension basically refers to the development of new strategies that can create value for the firm. Finally, the behavioural dimension corresponds to the individual, team, or management attitudes towards newness. Firms with an innovative behavioural culture are able to foster novel ideas faster and more successfully than firms without it (Wang and Ahmed, 2004).

Thus, we argue that innovativeness would have a positive impact on firm performance. As the positive influence of innovativeness on firm performance has been frequently reported in previous studies (Deeds et al., 1999; Gurisatti et al., 1997), we just propose it as a control relationship hypothesised to be corroborated in the small firm context as well.

2.2 *Hypothesised relationships among small firm network configuration, innovativeness, and performance*

Networking is considered as an important activity not only for small firms but also for larger firms (Lorenzoni and Lipparini, 1999). In the case of small firms, however, networks are especially beneficial because they allow firms to access technical or commercial resources that they would otherwise lack (Hoang and Antoncic, 2003), and they also enhance organisational learning (Kale et al., 2002). Although it is likely that similarities in the network configuration of small firms might exist, each firm has its own unique way of networking. This study investigates whether firms displaying dissimilar network configurations also display differences in other areas. We hence look at a firm's network configuration from three different perspectives:

- i the type of partner (which can be small firms, large firms, universities, or government agencies)
- ii the type of relationship (with a customer or partner)
- iii the number of relationships in each category.

According to Ostgaard and Birley (1994), looking into different network configurations helps us to understand the benefits associated with each form of relationship. Firms typically develop different network configurations to support a specific strategic focus (Koch, 2004) or an innovation focus (Gemunden et al., 1996), or because they aim towards different performance levels (Baum et al., 2000). However, limited research has investigated the effects of networking configuration or patterns.

In this paper, we consider explicitly two key network configurations: networking with customers and networking with partners. According to Pittaway et al. (2004), networking with customers is the most common form of collaboration. These collaborations are typically conducted with a long-term perspective because they are thought to lead to a better performance level for both parties (Barney et al., 2001). Networking with customers in the production process helps firms to manufacture customised products that lead to a higher degree of commercial success. A recent study by Jacob (2006) found support for a link between customer integration and market success. Compared with customer networking, networking in the form of a partnership can also include those actors that do not necessarily share any direct relationships with the focal firm. Partnerships can be formed with different actors, for example small firms, large firms, government institutions, or universities. However, the motives for partnership can vary widely. For example, a university might collaborate with partners to spread and publish knowledge of its research work, whereas industrial firms might network in order to achieve financial gains and develop competitive commercial products. Although firms may have different motives for entering network arrangements, it seems clear that having partnerships with different organisations may lead to a wider knowledge base, which may result in better performance (Etzkowitz and Leydesdorff, 2000).

It is acknowledged that diverse network relations hold valuable information, competencies, and resources resulting in unique competitive advantages improving firm performance. This argument is also related to the finding of Burt (2004), which argues for benefits from structural holes, i.e., being able to use the knowledge and information gained from one network in another setting or network, which leads to innovative ideas and positive performance. However, not all the relations are equally advantageous,

as some of them might prey on the scarce resources of the small firms and increase overheads (Anand and Khanna, 2000). Besides, when small firms network with large firms, the possibility for opportunistic behaviour tends to be high, due to their low bargaining power. In such circumstances, the creation of customer or partnership networks would lead to a negative effect on performance. Still, the arguments for a positive impact of networking on better performance are overwhelming. Thus, we posit a positive impact of each network contact (networking with a customer or partnership) on firm performance.

H1: Networking with customers and networking with partners are both positively related to small firm performance.

According to Powell et al. (1996), the ‘locus of innovation’ no longer lies within individual firms but rather in their network. Similarly, Chesbrough (2003, p.20) referred to a shift from a ‘closed to an open innovation paradigm’, where the latter encompasses cooperation for innovation among independent organisations. When firms collaborate in such a manner, new ideas emerge because different firms bring their unique competence and background to the network (Westerberg and Wincent, 2007). The chance of success with innovation also tends to increase when it is developed in a network, as the end product tends to be more complex and commercially viable (Pittaway et al., 2004). According to von Hippel (1978), lead users and customers play a vital role in the innovation process as they bring novel ideas for development. Customer involvement assists in the development of incremental innovation as firms can better understand the needs and wants of customers (Ragatz et al., 1997).

According to Pittaway et al.,

“the extent to which customers actively contribute to the innovation process is less clear, as the evidence points to this being driven by the innovating firms balancing market awareness with technical feasibility.”
(Pittaway et al., 2004, p.152)

Similarly, partnerships are not always fruitful for innovative development as firms might lose their competitive ideas by sharing with other firms and competitors. This would create ‘copy cat’ products in the market and loss of revenues from firm innovation. However, as the previous findings and the above conceptual arguments seem more in favour of positive outcomes of networking for firms’ innovativeness, it seems feasible to hypothesise that:

H2: Networking with customers and networking with partners are both positively related to small firm innovativeness.

2.3 Relationships among small firm network capability, innovativeness, and performance

Dense network configurations can grant a firm access to external resources. However, as the capability-based literature suggests, it is difficult to maintain a competitive advantage by solely relying upon resources. Firms need to have distinct capabilities to integrate different resources and make them perform some advantageous task or activity (Baden-Fuller, 1995; Penrose, 1959). Capabilities are

“complex bundles of skills and accumulated knowledge, exercised through organisational processes that enable firms to coordinate activities and make use of their assets.” (Day, 1994, p.38)

As this study focuses on small firms and they usually suffer from the liability of smallness, which implies limited resources and capabilities, we propose NC as a valuable tool for small firms to improve performance. Kale et al. (2002) also noted that it is not enough to have networks, it is also vital for firms to utilise their network effectively for success.

According to Walter et al. (2006), NC is a firm’s ability to develop and utilise inter-firm relations. Furthermore, they conceptualise NC as a multidimensional construct consisting of four components, namely

- 1 coordination
- 2 relational skills
- 3 partner knowledge
- 4 internal communication.

These components are distinct but would often appear related. In fact, these components are argued to support each other, thus increasing the magnitude of a firm’s NC as these components increase (Walter et al., 2006). Firms are able to *coordinate* several relationships with external partners. However, as the number of relations increases, it might become difficult for firms to manage these relations and several conflicts of interest might arise. Firms with NC also reflect high degrees of partner knowledge, which helps them in organising and structuring information about different partners. This characteristic is specifically valuable for small firms as they would be able to understand and utilise their relationships better (Anand and Khanna, 2000). Firms also need appropriate *relationship skills* to manage relationships because business relationships are very often inter-personal exchange situations (Walter et al., 2006). In addition, *internal communication*, i.e., firms’ ability to be responsive and open to effective organisational learning within partner arrangements, is an essential part of NC (Doz, 1996). Although the above four components have been used previously to capture NC, they miss the crucial aspect of *building new relationships*. Thus, we will propose a new component, which is related to firms’ ability to be open towards new relations with new partners. This implies that firms should have a proactive attitude and that they should initiate contacts with new partners.

In general, small firms are argued to be facing greater risks of failure than larger firms, which are assumed to arise from their liability of smallness, i.e., their lack of infrastructures and qualified human capital as well as having limited in-house resources (van de Vrande et al., 2009). Arguably, small firms should, therefore, due to these specific reasons, benefit from managing inter-organisational relationships to achieve a better performance. However, not all the networking relationships add to a firm’s competitiveness and performance because, to make a network prosper in the long term, the firm should invest a lot of money, time, resources, and effort, which small firms typically lack. Besides, there is a network failure risk. Networks appear to encounter problems for a variety of reasons: overlapping partners or activities, inter-firm conflict, displacement, lack of scale, external disruption, and so on (Kale et al., 2002; Pittaway et al., 2004). Similarly, having good partner knowledge will allow small firms

to make better sense of which partners can really help them to overcome their limitations, to avoid or handle instabilities, to reduce transaction control costs, and to have proactive and solution-oriented conflict management (Walter et al., 2006). Internal communication will help small firms to avoid redundant processes – with the resulting resource and miscommunication saving also improving the detection of synergies between partners (Cohen and Levinthal, 1990). In addition, knowing your partners' possibilities and having good relational skills and the ability to coordinate partners in supportive interactions could be prerequisites for the new venture to act more proactively in developing its competitiveness and performance (Roininen, 2008). It is thus the nature of the relationships between the partners in networks or alliances that becomes the valuable and rare resource that could help small firms to achieve better performance. In this sense, NC is understood as dynamic processes and as a higher-order resource (Teece et al., 1997). Therefore, we propose:

H3: Networking Capability is positively related to small firm performance.

Due to the increasing complexity of technologies, capabilities needed, and risks implied, firms – and especially small firms – increasingly opt for collaborative innovation (Walter et al., 2006). However, firms with high levels of technical and commercial competence, the most desirable partners, are less likely to see the value of forming network relationships with other firms (Pittaway et al., 2004). Besides, businesses with few existing relationships, as is the case of small firms, often lack the technical and commercial competences required when trying to attract partners. So, building new relationships and not only cooperating with existing and known partners will allow small firms to bring other new and important partners into the network, providing new ideas (Roininen, 2008) and enabling them to develop thinking that steps outside their particular business system (Pittaway et al., 2004). Besides, the relational skills of small firms can compensate for their initial lack of attractiveness as business relationships are very often inter-personal exchange situations where the extraversion, communication ability, and empathy of the management team can play a fundamental role when searching for partners with whom to cooperate. Small firms with good partner knowledge, an ability to develop and maintain new and existing relations, capabilities to coordinate these relations, and good internal communication are therefore argued to enhance their own propensity to take risks and to be proactive and innovative in their exploitation. This also allows firms to focus on their core activities and interlink these with other firms' resources. Cooperative competencies play an important role in fostering the success of this process (Sivadas and Dwyer, 2000).

In this context, NC is a key to creating a sustainable win-win situation because only networks with perceived fair value sharing can prosper in the long term. NC balances the danger of out-learning and being out-learned by developing a mutual understanding of the benefit for the small firms and their network's partners, so it reduces the risk of intra-alliance rivalry, safeguarding property rights when complete and contingent contracts are not possible (Pittaway et al., 2004). Based on all these findings, the following hypothesis is proposed:

H4: Networking Capability is positively related to small firm innovativeness.

3 Method and research approach

Data for this study were gathered from Swedish technology-based small firms by a postal survey. There were several reasons for selecting these firms. Firstly, technology-based small firms represent a high growth potential industry in terms of both sales and employment (Delmar et al., 2003), making this particular group of small firms highly interesting and relevant for studying. Secondly, as technology-based small firms mainly rely on regular innovations to secure their competitiveness (Powell et al., 1996), examining the relation between networking practices and innovativeness has greater implications for them. Thirdly, they are considered front-runner firms as they often work globally and develop innovative products/services. Finally, it has also been argued that, when studying new relations (exploratory study), such as in this case, it is advisable to focus on a single industry. According to Westerberg et al. (1997), such a focus would make the data less vulnerable to the effects of uncontrolled variables, as sample firms are from a common environment.

The firms were sampled on the Swedish industry index (SNI) code 72220 representing *consultancy-related computer systems or computer software firms*. These firms deal with ICT products or services. When we searched for this code on a Swedish business database (Affärsdata), we found approximately 9000 active firms, and after constraining the targeted population to firms with fewer than 50 employees (i.e., small firms according to the EU definition) and more than 1 million Swedish SEK (approximately 100,000 euro) in sales (to ensure an active firm), we ended up with 3907 active firms. This was considered as the total population from which 1471 firms were selected.

A self-administrated questionnaire was subsequently developed, and to enhance external validity, the questionnaire was checked for any problems or irregularities and was pre-tested on CEOs of small firms in a similar industry. The period of pre-testing lasted for almost one month (March 2007). Any doubts, misunderstandings, or queries were noted and the questionnaire was modified. This modified version was further tested on new additional respondents. This process continued until no major changes were required. Finally, the definitive questionnaires were mailed during May–July 2007. The questionnaire was addressed to the Chief Executive Officer (CEO) of the firm, with a motivation letter explaining the purpose of this study. As the unit of analysis is at the firm level, and to gain the holistic view of firms' operations, it was deemed more appropriate to send the questionnaire to the CEO. We received 291 workable questionnaires back, which represent a 21% response rate. Although this is not a very high response rate, it is sufficient for the statistical analysis, and also equal to many previous studies published (Roininen, 2008). A non-response analysis was performed by comparing different variables such as firm age (year of establishment), size (number of employees), profit, and solidity (i.e., the degree of internally funded capital). The analysis showed no significant differences between respondents and non-respondents.

3.1 Measures

In the questionnaire developed to collect data, we used four main variables – firm performance, innovativeness, network configuration, and NC – and several control variables (for details see Appendix A). For all the variables, except for network

configuration, a seven-point Likert scale was used, ranging from 'strongly disagree' to 'strongly agree' (-3 to 3).

3.2 Dependent variables

Small firm performance has mainly been measured based on financial aspects. This provides limited information regarding the performance. Therefore, several studies have supported the notion of including a multiple-item scale to measure performance (Walter et al., 2006). According to Chandler and Hanks (1993), asking small firms to evaluate their performance in comparison with that of their competitors leads to a higher level of reliability and validity. Based on the studies of Walter et al. (2006) and Lichtenthaler (2009), in this study self-reported measurement of five different firm performance items in relation to competitors has been used. The questions related to financial performance, sales growth in established as well as in new markets, customer satisfaction, and customer loyalty. The Cronbach's alpha for firm performance was 0.65.

Innovativeness was measured using five items based on the study of Wang and Ahmed (2004). They conceptualised this construct with five questions addressing product innovation, process innovation, strategy innovation, behaviour innovation, and market innovation. These items covered several ways in which firms can reflect innovativeness that have been overlooked in previous studies (Cronbach's alpha = 0.81).

3.3 Independent variables

Networking Capability was based on the refined scale of Walter et al. (2006). To capture each of the four dimensions, three items were used (coordination activities, relationship skills, partner knowledge, and internal communication) related to NC. Another dimension was added, referring to building new relationships, and it was also measured by three items. During factor analysis, we did not observe any cross-loading and items loaded on the corresponding dimension (see Appendix A). The Cronbach's alpha of NC (15 items) was 0.76.

Finally, *network configuration* was measured by asking respondents to state the number of organisations with which they have *strategic and repetitive contact* within eight different categories. The categorisation was based on three different perspectives:

- i the type of partner (which can be small firms, large firms, universities, or government agencies)
- ii the type of relationship with the partner (customer or partner)
- iii the number of relationships in each category.

All these relations were aggregated into representing networking with either a customer or a partner based on the log value.

3.4 Control variables

We also used firm size, environmental dynamism, and hostility as control variables. Firm size was calculated by taking the log of the total number of employees. Size was considered important because larger firms might be able to innovate faster than micro firms (fewer than nine employees) due to their possession of greater resources.

The environment was captured by the traditional scale developed by Miller and Friesen (1982), including dimensions of dynamism and hostility. All the measurements were pre-tested and modified before sending the surveys based on the feedback from both scholars and practitioners. Factor analysis was run to check the validity of the scales used in the questionnaire, obtaining satisfactory results (see appendix A). We also tested for the reliability of the test and found all the alpha value above 0.65. In order to contrast our hypotheses, hierarchical regression analysis was conducted.

4 Data analysis and results

Table 1 presents the mean, standard deviation, and the Pearson correlation for all the studied variables. The correlation matrix shows that both networking components have positive and statistically significant bi-variate correlation with innovativeness and firm performance. Furthermore, innovativeness is also strongly correlated with firm performance.

Table 1 Correlation matrix and details of variables

| Latent construct | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------------|-------|-------|---------|----------|---------|---------|---------|---------|---------|---|
| 1 Firm size (employees) | 15.81 | 14.65 | 1 | | | | | | | |
| 2 Environmental dynamism | -0.54 | 1.24 | -0.08 | 1 | | | | | | |
| 3 Environmental hostility | -0.85 | 1.16 | 0.00 | 0.39*** | 1 | | | | | |
| 4 Networking with customers | 2.33 | 1.49 | 0.31*** | 0.00 | -0.11 | 1 | | | | |
| 5 Networking with partners | 0.69 | 0.75 | 0.35*** | -0.09 | -0.12** | 0.42*** | 1 | | | |
| 6 Networking Capability (NC) | 1.69 | 0.71 | 0.25*** | 0.00 | -0.15** | 0.20*** | 0.05 | 1 | | |
| 7 Innovativeness | 1.14 | 1.04 | 0.24*** | -0.04 | -0.06 | 0.14** | 0.25*** | 0.42*** | 1 | |
| 8 Firm performance | 0.94 | 0.79 | 0.21*** | -0.18*** | -0.12* | 0.14** | 0.19*** | 0.33*** | 0.33*** | 1 |

Likert scale: -3 to +3 (except for networking configuration).

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ two-tailed.

Hierarchical regression analysis was conducted in order to confirm the proposed hypotheses (see Table 2). In addition to testing the detailed effect of NC, we also conducted an additional analysis including its dimensions. All the models were tested for multi-collinearity and the Variance Inflation Factor (VIF) values ranged between 1.28 and 1.83, which implies that multi-collinearity is not a serious problem. Innovativeness and firm performance are the dependent variables and we controlled for firm size and environmental conditions. Model I examines the relation among network configuration, NC, and innovativeness. Network configuration has a partial positive association with innovativeness. Particularly, networking with customers has the strongest influence on firms' ability to innovative ($\beta = 0.23$, $p < 0.01$).

Thus, Hypothesis 2 is partially supported. Hypothesis 4, which proposed that NC has a positive influence on innovativeness, is also supported ($\beta = 0.40$, $p < 0.01$). Model II aims to further knowledge by observing which of the dimensions of NC has the strongest link to innovativeness. The results show that internal communication ($\beta = 0.29$, $p < 0.01$), partner knowledge ($\beta = 0.13$, $p < 0.10$), and building new relations ($\beta = 0.13$, $p < 0.10$) are the significant dimensions.

Table 2 Correlation matrix and details of variables

| | <i>Innovativeness</i> | | <i>Firm performance</i> | |
|-----------------------------|-----------------------|-----------------|-------------------------|-----------------|
| | <i>Model I</i> | <i>Model II</i> | <i>Model III</i> | <i>Model IV</i> |
| Firm size (log) | 0.66 | 0.03 | 0.09 | 0.07 |
| Environmental dynamism | -0.02 | -0.03 | -0.15** | -0.17** |
| Environmental hostility | 0.05 | 0.05 | 0.02 | 0.01 |
| Networking with partners | -0.05 | -0.03 | 0.01 | 0.03 |
| Networking with customers | 0.23*** | 0.24*** | 0.07 | 0.08 |
| Networking Capability (NC) | 0.40*** | | 0.24*** | |
| NC – Coordination | | -0.05 | | 0.11 |
| NC – Relational skill | | 0.10 | | 0.01 |
| NC – Partner knowledge | | 0.13* | | 0.12 |
| NC – Internal communication | | 0.29*** | | 0.17** |
| NC – Building | | 0.13* | | -0.05 |
| Innovativeness | | | 0.19*** | 0.18*** |
| <i>F</i> -ratio | 12.41 | 8.80 | 8.83 | 6.25 |
| <i>R</i> -Square | 0.23 | 0.27 | 0.21 | 0.23 |
| <i>R</i> -Square Adj. | 0.27 | 0.24 | 0.18 | 0.19 |
| Std. error of the estimate | 0.91 | 0.89 | 0.91 | 0.90 |
| Significance | <0.001 | <0.001 | <0.001 | <0.001 |

$N = 291$.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ regression coefficients shown are beta coefficients.

Model III subsequently tests the influence of network configuration, NC, and innovativeness on firm performance. Hypothesis 1, which suggested a link between network configuration and firm performance, is not supported. However, NC has a statistically significant impact on firm performance. Thus, Hypothesis 3 is supported ($\beta = 0.24$, $p < 0.01$). Model IV indicates that the internal communication component ($\beta = 0.15$, $p < 0.05$) is the only NC dimension that remains significant when we analyse them separately. The results also indicate that innovativeness has a positive influence on firm performance. Thus, the control relation is supported ($\beta = 0.21$, $p < 0.01$). The overall explanatory level for all the models has been satisfactory with an adjusted *R*-square between 0.18 and 0.27.

The obtained results after the regressions suggest the direction of a possible mediating relation between networking practices and performance through innovativeness. According to Baron and Kenny (1986), there are three major conditions required to support a mediation effect:

- 1 the relationship between the independent (networking configuration) and the mediating variable (innovativeness) should be tested
- 2 the relationship between the mediating (innovativeness) and the dependent variable (firm performance) should be tested
- 3 finally, the coefficients between the independent (network configuration) and the dependent variables (firm performance) should increase when the mediation variable is taken away.

In this study, the first two conditions are satisfied as both network configuration's and NC's relations to innovativeness and innovativeness' relation to performance have already been tested. The third condition requires some additional analysis. We found that our assumption regarding a mediating effect was partially supported as networking with customers, which was not significant using Models III and IV, increased ($\beta = 0.13, p < 0.05$). Also, a NC dimension of the partner knowledge beta value increased and became significant ($\beta = 0.14, p < 0.10$). These changes indicate that the missing relationship between network configuration and networking dimensions and performance was mediated through innovativeness. The next section discusses these results.

5 Discussion and conclusions

Networking-based literature has been growing in the last decades. Still, only a handful of studies have focused on the small firm networking practices for innovativeness and performance. Benefits associated with networking are clearly established (Powell et al., 1996); however, which form of network is more beneficial to small firms and how they can utilise these network relations are unexplored research topics. In our study, we made a modest attempt to provide some insights into this matter. Our results suggest that, in the case of small technology-based firms, networking with customers and the possession of NC have a stronger influence on innovativeness. Small firms usually focus on niche markets so, through involving customers in their innovation process, they will have direct access to their customers' needs and expectations, which in turn serves as a strong facilitator for commercially viable innovations. We also found a non-significant relationship between innovativeness and networking with partners. This highlights a possible lack of commitment in partnership configurations as there is no direct relation among partners and each partner might be focused on its own objectives. In addition, networking with partners raises the risks of being out-learned, sharing core knowledge, and the fear of encouraging new competitors to gain access to their markets (Pittaway et al., 2004).

We believe that this is the first study to show the influence of NC on innovativeness from a small firm perspective. In previous studies, Roininen (2008) and Walter et al. (2006) have mainly focused on the relation between NC, entrepreneurial activities, and performance for new ventures. Our study builds on the existing literature and supports the view that NC is also valuable for innovativeness, i.e. being able to utilise the existing inter-firm relations effectively is the key to innovative development in small technology-based firms. In particular, we find that focusing on being responsive and open to organisational learning from partners through internal communication, along with the

possession of sufficient partner knowledge and having a collaborative attitude towards new prospective partners, are imperative ingredients for innovativeness.

Thus, considering the outcomes, small firms should stress developing customer-oriented networks. Additionally, they should develop the ability to organise and structure information about partners in order to understand and utilise their relationships better, communicate the newly acquired knowledge with the firm, and reflect an open attitude towards new relations with new partners. Together, these would maximise their ability to utilise the networks for innovativeness.

We also found that network configuration did not have any significant impact on performance. This was a revelation as the bi-variant coefficient for networking with customers and partners was highly significant for performance. Thus, we suspected some mediation effect of innovativeness on the relations with network configuration and performance. After performing an additional analysis suggested by Baron and Kenny (1986), we found that networking with customers was marginally significant for performance, when innovativeness was removed from the regression model. Thus, even when studies have argued that diverse network relations hold valuable information, competencies, and resources resulting in the development of unique competitive advantages and an improved effect on firm performance, the main benefit from network configuration can be to support the development of novel ideas or innovation driven by a better understanding of customers' wants and needs (Ragatz et al., 1997), which finally leads to stronger performance.

NC has a strong influence on performance, which can be interpreted as the network *per se* not granting any additional competitive advantage if the ability to develop, utilise, and maintain close inter-organisational relationships is missing. Small firms without the appropriate capability would struggle to achieve better financial impacts, sales growth, and customer relationships. The analysis also shows that internal communication is the most valuable dimension for reaching a better performance, which holds true due to the critical role of utilising external knowledge through well-established communication within the small firms. Finally, consistent with previous research, the results of this study show that innovativeness relates positively to performance.

In conclusion, our finding suggests that the networking practices are highly important for small firm innovativeness and performance. Small firms face several challenges due to size limitation; however, networking with customers and developing networking capabilities facilitates them in becoming innovative, and by doing so, they are also able to achieve better performance.

This study is, of course, not without limitations. However, these limitations can be addressed in future studies. First, as our study investigates technology-based small Swedish firms, the scope for generalisation is limited. Future studies should attempt to integrate other industries and different countries of origin and compare the findings. Second, the network literature is vast and includes several related concepts that could have been integrated into this study, such as structural holes (Burt, 2004), strong and weak ties, and others, but the scope of this study is limited and we were unable to integrate them. Third, we find some support for the mediating effect of innovativeness on the relations between networking configuration and performance. This needs further investigation and structural equation modelling can be used to capture this effect. Finally, due to the small sample size, we were not able to observe several significant effects of network capability and networking configuration dimensions. Future studies can aim at including a large sample base.

5.1 Managerial implications

The main managerial implication of this study addresses the issues of securing a high level of innovativeness and performance for managers of technology-based small firms. Small firms usually start their venture with the launch of innovative products but, due to a lack of capacity to re-innovate at later stages, most of these firms struggle to survive. Innovativeness is imperative for small firms' market growth, sales growth, profitability, and a high level of customer satisfaction and loyalty. Thus, R&D should not be regarded as a cost, but rather as an investment and as a part of a firm's long-term success strategy. Our study also finds support for the importance of network practices for achieving innovativeness and performance. Especially networking with customers should be prioritised as it shows a strong relation to innovativeness, which later leads to better performance. Networking with partners was not significantly related to innovativeness or performance. However, we would argue that, if small firms have enough resources and competences to manage and utilise several relations with partners, it can also be a potential path for innovativeness.

The ability to utilise the inter-firm relations demonstrates highly significant links to innovativeness and performance. Thus, firm managers should rather focus on developing NC than initiating several relations with customers or partners. Internal communication within the firm has implications for enhancing organisational learning and facilitates the conception of potential ideas. This activity can be supported by having appropriate partner knowledge, as it would create the image of an attractive partner and would also help in forming new relations. Moreover, being open towards new relations with new partners also assists higher innovativeness and performance.

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References

- Anand, B.N. and Khanna, T. (2000) 'Do firms learn to create value? The case of alliances', *Strategic Management Journal*, Vol. 21, No. 3, pp.295–315.
- Baden-Fuller, R.P. (1995) 'Strategic innovation, corporate entrepreneurship and matching outside-in to inside-out approaches to strategy research', *British Journal of Management*, Vol. 6 (Special Issue), pp.1–14.
- Barney, J., Wright, M. and Ketchen, D.J. (2001) 'The resource-based view of the firm: ten years after 1991', *Journal of Management*, Vol. 27, No. 6, pp.625–641.
- Baron, R.M. and Kenny, D.A. (1986) 'The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical consideration', *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp.1173–1182.
- Baum, J.A., Caladrese, T. and Silverman, B.S. (2000) 'Don't go it alone: alliance network composition and start-ups' performance in Canadian biotechnology', *Strategic Management Journal*, Vol. 21, No. 3, pp.267–294.

- Borgatti, S.P. and Foster, P.C. (2003) 'The network paradigm in organizational research: a review and typology', *Journal of Management*, Vol. 26, No. 6, pp.991–1013.
- Bougrain, F. and Haudeville, B. (2002) 'Innovation, collaboration and SMEs internal research capacities', *Research Policy*, Vol. 31, No. 5, pp.735–747.
- Burt, R.S. (2004) 'Structural holes and good ideas', *The American Journal of Sociology*, Vol. 110, No. 2, pp.349–399.
- Calia, R.C., Guerrini, F.M. and Moura, G.L. (2007) 'Innovation networks: from technological development to business model reconfiguration', *Technovation*, Vol. 27, No. 8, pp.426–432.
- Chandler, G.N. and Hanks, S.H. (1993) 'Measuring the performance of emerging businesses: A validation study', *Journal of Business Venturing*, Vol. 8, No. 5, pp.391–408.
- Chesbrough, H.W. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston.
- Cohen, W.M. and Levinthal, D.A. (1990) 'Absorptive capacity: a new perspective on learning and innovation', *Administrative Science Quarterly*, Vol. 35, March, pp.128–152.
- Cooper, A.C. (1995) 'Challenges in predicting new venture performance', in Bull, I., Thomas, H. and Willard, G. (Eds.): *Entrepreneurship: Perspectives on Theory Building*, Elsevier Science Ltd., London.
- Cooper, R.G., Edgett, S.J. and Kleinschmidt, E.J. (2003) *Best Practices in Product Innovation: What Distinguishes Top Performers*, Product Development Institute, Ancaster, Ontario.
- Day, G.S. (1994) 'The capabilities of market-driven organizations', *The Journal of Marketing*, Vol. 58, No. 4, pp.37–52.
- Deeds, D.L., DeCarolis, D. and Coombs, J. (1999) 'Dynamic capabilities and new product development in high technology ventures: An empirical analysis of new biotechnology firms', *Journal of Business Venturing*, Vol. 15, No. 3, pp.211–229.
- Delmar, F., Davidsson, P. and Gartner, W.B. (2003) 'Arriving at the high-growth firm', *Journal of Business Venturing*, Vol. 18, No. 2, pp.189–216.
- De Toni, A. and Nassimbeni, G. (2003) 'Small and medium district enterprises and the new product development challenge: evidence from the Italian eyewear district', *International Journal of Operations and Production Management*, Vol. 23, Nos. 5–6, pp.678–697.
- Doz, Y. (1996) 'The evolution of cooperation in strategic alliances: initial conditions or learning processes?', *Strategic Management Journal*, Vol. 17, No. s1, pp.55–79.
- Etzkowitz, H. and Leydesdorff, L. (2000) 'The dynamics of innovation: from national systems and 'mode a' to a triple helix of university-industry-government relations', *Research Policy*, Vol. 29, No. 2, pp.109–123.
- European Commission (2006) *A Guide to SME Policy*, Obtained through the internet: http://ec.europa.eu/enterprise/smes/index_en.htm [accessed 24/1/2008].
- Frishammar, J. and Andersson, S. (2009) 'The overestimated role of strategic orientations for international performance in smaller firms', *Journal of International Entrepreneurship*, Vol. 7, No. 1, pp.57–77.
- Gemunden, H.G., Ritter, T. and Heydebreck, P. (1996) 'Network configuration and innovation success: an empirical analysis in German high-tech industries', *International Journal of Research in Marketing*, Vol. 13, No. 5, pp.449–462.
- Grando, A. and Belvedere, V. (2006) 'District's manufacturing performances: a comparison among large, small-to-medium-sized and district enterprises', *International Journal of Production Economics*, Vol. 104, No. 1, pp.85–99.
- Griffiths-Hemans, J. and Grover, R. (2006) 'Setting the stage for creative new products: investigating the idea fruition process', *Journal of the Academy of Marketing Science*, Vol. 34, No. 1, pp.27–39.
- Gurisatti, P., Soli, V. and Tattara, G. (1997) 'Patterns of diffusion of new technologies in small metal-working firms: the case of an Italian region', *Industrial and Corporate Change*, Vol. 6, No. 2, pp.275–312.

- Hoang, H. and Antoncic, B. (2003) 'Network-based research in entrepreneurship: a critical review', *Journal of Business Venturing*, Vol. 18, No. 2, pp.165–187.
- Hörte, S-Å., Barth, H., Chibba, A., Florén, H., Frishammar, J., Halila, F., Rundquist, J. and Tell, J. (2008) 'Product development in SMEs: a literature review', *International Journal of Technology Intelligence and Planning*, Vol. 4, No. 3, pp.299–325.
- Jacob, F. (2006) 'Preparing industrial suppliers for customer integration', *Industrial Marketing Management*, Vol. 35, No. 1, pp.45–56.
- Kale, P., Dyer, J.H. and Singh, H. (2002) 'Alliance capability, stock market response, and long-term alliance success: the role of the alliance function', *Strategic Management Journal*, Vol. 23, No. 8, pp.747–767.
- Koch, C. (2004) 'Innovation networking between stability and political dynamics', *Technovation*, Vol. 24, No. 9, pp.729–739.
- Koufteros, X., Vonderembse, M. and Jayaram, J. (2005) 'Internal and external integration for product development: the contingency, effects of uncertainty, equivocality, and platform strategy', *Decision Science*, Vol. 36, No. 1, pp.97–133.
- Lichtenthaler, U. (2009) 'Absorptive capacity, environmental turbulence and its complementarity of organizational learning processes', *Academy of Management Review*, Vol. 52, No. 4, pp.822–846.
- Lorenzoni, G. and Lipparini, A. (1999) 'The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study', *Strategic Management Journal*, Vol. 20, No. 4, pp.317–338.
- Miller, D. and Friesen, P.H. (1982) 'Innovation in conservative and entrepreneurial firms: two models of strategic momentum', *Strategic Management Journal*, Vol. 3, No. 1, pp.1–25.
- Ostgaard, T.A. and Birley, S. (1994) 'Personal networks and firm competitive strategy: a strategic or coincidental match?', *Journal of Business Venturing*, Vol. 9, No. 4, pp.281–305.
- Penrose, E.T. (1959) *The Theory of the Growth of the Firm*, Wiley, New York.
- Pittaway, L., Robertos, M., Munir, K., Denyer, D. and Neely, A. (2004) 'Networking and innovation: a systematic review of the evidence', *International Journal of Management Reviews*, Vol. 5, No. 6, pp.137–168.
- Powell, W.W., Koput, K.W. and Smith-Doerr, L. (1996) 'Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology', *Administrative Science Quarterly*, Vol. 41, No. 1, pp.116–145.
- Ragatz, G.L., Handfield, R.B. and Petersen, K.J. (2002) 'Benefits associated with supplier integration into new product development under conditions of technology uncertainty', *Journal of Business*, Vol. 55, No. 5, pp.389–400.
- Ragatz, G., Handfield, R. and Scannell, T. (1997) 'Success factor for integrating suppliers into new product development', *Journal of Product Innovation Management*, Vol. 14, No. 3, pp.190–202.
- Rodrigues, C., Fernandes, E. and Martins, F.V. (2007) 'Network innovativeness and SMEs: evidence from the Portuguese case', *Proceedings of the 14th IPDM*, Porto Portugal, Vol. 3, No. 3, June, pp.1213–1223.
- Roininen, S. (2008) 'Start-ups' achievement of competitive advantages through network relations', *International Journal of Technoentrepreneurship*, Vol. 1, No. 3, pp.278–295.
- Sethi, R., Smith, D.C. and Park, C.W. (2001) 'Cross-functional product development teams, creativity, and the innovativeness of new consumer products', *Journal of Marketing Research*, Vol. 38, No. 1, pp.73–85.
- Sivadas, E. and Dwyer, F.R. (2000) 'An examination of organizational factors influencing new product success in internal and alliance-based processes', *Journal of Marketing*, Vol. 64, No. 1, pp.31–50.
- Teece, D.J., Pisano, G. and Schuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, Vol. 18, No. 7, pp.509–533.

- Van De Vrande, V., De Jong, J.P.J., Vanhaverbeke, W. and De Rochemont, M. (2009) 'Open innovation in SMEs: trends, motives and management challenges', *Technovation*, Vol. 29, Nos. 6, 7, pp.423–437.
- Von Hippel, E. (1978) 'Successful industrial products from customer ideas: a paradigm, evidence and implication', *Journal of Marketing*, Vol. 42, No. 1, pp.39–49.
- Walter, A., Auer, M. and Ritter, T. (2006) 'The impact of networking capabilities and entrepreneurial orientation on university spin-off performance', *Journal of Business Venturing*, Vol. 21, No. 4, pp.541–567.
- Wang, C.L. and Ahmed, P.K. (2004) 'The development and validation of the organisational innovativeness construct using confirmatory factor analysis', *European Journal of Innovation Management*, Vol. 4, No. 7, pp.303–313.
- Westerberg, M., Singh, J. and Häckner, E. (1997) 'Does the CEO matter? An empirical study of small Swedish firms operating in turbulent environments', *Scandinavian Journal of Management*, Vol. 13, No. 3, pp.251–270.
- Westerberg, M. and Wincent, J. (2007) 'Network capability and entrepreneurship: refinement of a scale and test of a framework', Paper presented at *AGSE-Babson Regional Entrepreneurship Research*, 5–8 February, Melbourne, Australia.
- Wiklund, J. (1999) 'The sustainability of the entrepreneurial orientation-performance relationship', *Entrepreneurship: Theory and Practice*, Vol. 24, No. 1, pp.37–49.

Appendix A

| Construct | Items | Loading | Alpha | Mean | S.D. |
|-------------------------------|---|---------|-------|------|------|
| | <i>In our firms</i> | | | | |
| <i>Coordination</i> | ... we analyse what we would like and desire to achieve with which partner | 0.78 | | | |
| | ... we develop relations with each partner based on what they can contribute | 0.68 | 0.74 | 1.39 | 1.01 |
| | ... we discuss regularly with our partners how we can support each other | 0.73 | | | |
| <i>Relational skills</i> | ... we have the ability to build good personal relationships with our business partners | 0.69 | | | |
| | ... we can deal flexibly with our partners | 0.78 | 0.83 | 1.99 | 0.87 |
| | ... we almost always solve problems constructively with our partners | 0.83 | | | |
| <i>Building new relations</i> | ... we are constantly open to new relations with new partners | 0.81 | | | |
| | ... we have the ability to initiate a mutual relationship with new partners | 0.76 | 0.82 | 1.86 | 1.03 |
| | ... we have our eyes open to find new partners | 0.86 | | | |
| <i>Partner knowledge</i> | ... we know our partners' markets | 0.83 | | | |
| | ... we know our partners' products/procedures/services | 0.82 | 0.87 | 1.41 | 1.04 |
| | ... we know our partners' strengths and weaknesses | 0.86 | | | |
| <i>Internal communication</i> | ... we have regular meetings for every project | 0.75 | | | |
| | ... employees develop informal contacts among themselves | 0.87 | 0.76 | 1.77 | 1.01 |
| | ... managers and employees often give feedback to each other | 0.79 | | | |

Appendix A (continued)

| <i>Construct</i> | <i>Items</i> | <i>Loading</i> | <i>Alpha</i> | <i>Mean</i> | <i>S.D.</i> |
|------------------------------|---|----------------|--------------|-------------|-------------|
| | <i>In our firms</i> | | | | |
| <i>Networking capability</i> | Coordination | 0.79 | 0.76 | 1.68 | 0.71 |
| | Relational skills | 0.79 | | | |
| | Building new relations | 0.68 | | | |
| | Partner knowledge | 0.75 | | | |
| | Internal communication | 0.56 | | | |
| <i>Innovativeness</i> | ... we are often first to introduce new ways of working ... we often introduce new products and services that are at the cutting edge of technology | 0.81 | | | |
| | ... we are constantly improving our business processes | 0.84 | | | |
| | ... we are often first to market new products and services | 0.56 | 0.81 | 1.14 | 1.04 |
| | ... we are willing to try new ways of doing things and seek unusual, novel solutions | 0.86 | | | |
| | <i>Considering the present situation and in relation to competitors in the principal industry</i> | 0.67 | | | |
| <i>Firm performance</i> | ... our profit level is | 0.58 | | | |
| | ... our sales growth on established markets is | 0.84 | | | |
| | ... our market growth on new markets is | 0.82 | | | |
| | ... our level of customer satisfaction is | 0.87 | 0.65 | 0.94 | 0.79 |
| | ... our level regarding customer loyalty is | 0.86 | | | |

Likert scale: -3 to +3.