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## Network capability, innovativeness, and performance: a multidimensional extension for entrepreneurship

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### ABSTRACT

Small- and start-up firms in the high-tech industry usually engage in networking to overcome resource, knowledge, and competence constraints in creative, innovation-based competition. Quite often, however, network relationships fail due to lack of network capability (NC), defined as the ability to manage and gain benefits from external relationships. In the present study, we propose and examine an updated five-dimension NC construct and test its effect on innovativeness and performance. Two independent high-tech samples of small firms and start-ups support measurement properties of the proposed NC construct and suggest that the often-overlooked dimension in NC research of network relationship building is important to include in a complete NC construct. Doing so can help explain organizational innovativeness and effects on the customer, sales, and innovation performance more effectively. As a result, we find support for the proposed NC scale and the importance of network capabilities for small companies and start-ups to remain competitive.

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alliance management;  
network competence;  
measure; entrepreneurship;  
innovativeness; innovation;  
financial performance

## Introduction

Physical (geographical) or psychological (knowledge-based) distance to resources, opportunities, and capital motivate small firms and start-ups in the high-tech industry to engage in networking (Andersson, Evers, and Griot 2013; Brekke 2015; Coduras, Saiz-Alvarez, and Ruiz 2016). Performance in high-tech small- and start-up firms has therefore been explained by meaningful inter-organisational relationships that provide access to external resources (Azadegan, Patel, and Parida 2013; Bouncken, Pesch, and Reuschl 2016; Caloghirou, Kastelli, and Tsakanikas 2004; Hagedoorn, Roijackers, and Kranenburg 2006; Thorgren, Wincent, and Örtqvist 2009; Vesalainen and Hakala 2014). From this perspective, several authors view networking as an organisational capability (Kohtamäki et al. 2013; Vesalainen and Hakala 2014; Walter, Auer, and Ritter 2006) and as a potent strategy to handle multiple relationships by coordinating, maintaining, complementing, and facilitating internal communication through partner knowledge to secure high performance (Baum, Calabrese, and Silverman 2000; Oliver 2001; Tolstoy and Agndal 2010; Wincent 2008). For more than 20 years, the

academic literature has referred to the distinctive ability to gain access to external resources as 'network capability' (NC) (Nooteboom, Coehoorn, and Der Zwaan 1992). Network capability consists of different components or dimensions (Kale, Dyer, and Singh 2002; Möller and Törrönen 2003), which has led to a tradition of measuring NC as a multidimensional construct. More specifically, network capability represents a firm's ability to develop and use inter-organizational relationships for its own benefit. Although most studies have emphasized the importance of possessing NC, limited studies have evaluated a multidimensional scale and approaches to measuring network capability and linking it to performance-oriented empirical models (Hagedoorn, Roijakkers, and Kranenburg 2006; Walter, Auer, and Ritter 2006).

In the present paper, we argue that prior studies on NC have at least three shortcomings. First, the historical view of relevant NC dimensions is limited. Recent research largely acknowledges the value of resources, ideas, and competencies being developed through new and diverse relationships (Obstfeld 2005; Wincent 2008). Still, conceptualizing NC lacks activities related to new relationships. Freel and de Jong (2009) found that different types of innovation (including novelty) strongly correlate with new forms of ties and provide a vital source of inspiration and new knowledge. This implies that currently used NC constructs could be underspecified and need a new dimension included that captures the network building function.

Second, in recent studies, it is evident that a networking–innovativeness–performance relationship exists, more so than the previously proposed networking–performance relationship (Gronum, Verreynne, and Kstelle 2012). Overall, the ability to manage relationships is strongly associated with innovativeness more than with performance (Parida, Westerberg, and Frishammar 2012; Vissa 2012). Furthermore, actively forming relationships unlocks the untapped benefits of social capital by driving innovativeness and, more specifically, provides technologically oriented small firms and start-ups with access to resources and complementary skills that they might otherwise be compelled to develop internally (Gronum, Verreynne, and Kstelle 2012). Thus, it seems that the effects of NC on performance may be more likely to occur *indirectly* through innovativeness rather than through direct association.

Third, given that national programs at large support regional network policies toward small- and technology-oriented networks, there is also a need to study how these may differ (Arshed, Carter, and Mason 2014). Start-ups close to a technological frontier are less selective when they engage in networking due to the greater need for a secure foothold in the market and the need to gain early legitimacy (Deakins 1999; Rauch et al. 2016; Sullivan Mort and Weerawardena 2006). In comparison, established small firms may be more selective with networking and motivated to acquire complementary resources rather than compensating for the lack of internal resources (Barth et al. 2015; Mancinelli and Mazzanti 2008). This implies that network capability may serve different functions for high-tech firms in different stages of the firm's life cycle (Brekke 2015; Oliver 2001). In light of such variations, we use a multi-sample approach to research whether network capability is central to both high-tech start-ups and small firms' innovativeness and performance.

The purpose of the present study is to develop and test a multidimensional operationalization of NC. Specifically, we study the effects of NC dimensions on innovativeness and performance outcomes in two samples. We do so by developing a five-dimensional NC measurement scale to include a previously neglected dimension – network relationship building – and analyse its effects on various outcomes while controlling the previously used four-dimensional NC scale. Adding a new dimension means including a dynamic aspect;

that is, a network capability for locating and building new relationships rather than merely managing and sustaining existing relationships. In addition, given known problems using an extensive enumeration of items in questionnaires, we test a proposed measurement instrument consisting of a five-dimensional network capability scale with a limited set of items (three) in each dimension. Earlier, Ritter, Wilkinson, and Johnston (2002) called for developing a shortened network capability scale that could be tested and validated across multiple samples.

## Literature review and hypothesis development

### *Network capability: defining the construct and its potential dimensions*

The first and most important choice a firm makes is what products to manufacture; thereafter, it decides where to locate its facilities (Pesämaa and Hair 2007). The choice of location incorporates networking and the type of access a specific location offers in a network (Brekke 2015). Thus, NC represents a critical development activity for firms, because it represents skills that allow an organization to efficiently *build, handle, and exploit* opportunities through relationships within and between networks (Vesalainen and Hakala 2014). Thus, at an abstract level, network success correlates to the ability to identify specific, targeted networks that help a firm overcome regional constraints (Smallbone and Welter 2012). One way to overcome regional constraints is to avoid becoming a victim of path dependency, which could prevent the firm from finding relevant competence or complementary knowledge. In addition, this can be present in potential lock-in effects with outdated partnerships with low-value knowledge.

An NC-focused study by Kale and colleagues (2002) noted that it is not sufficient to have potential network relationships. Instead, it is vital for firms to achieve network success by integrating strategic and operational thinking and ensuring long-term relationships without neglecting to develop new ones. Such a broad perspective has led scholars to define network capability in several different ways in previous research. For example, Foss (1999) highlighted the need to include collective learning and the importance of viewing network capability as related to resource building. Later, Hagedoorn, Roijakkers, and Kranenburg (2006, 41) suggested emphasizing ‘firm-specific partnering capabilities that enable a company to place itself in a particular position in a broader network of partnerships with multiple companies.’ To capture the range of abilities needed, Walter, Auer, and Ritter (2006, 542) defined network-ing capability as a firm’s ‘ability to develop and utilize inter-organisational relationships to gain access to various resources held by other actors.’ This view stresses that firms with high NC can identify strategic partners, then subsequently maintain close and beneficial relationships with those partners. Furthermore, this definition stresses that companies need to both develop and capitalize on relationships to gain and develop organizational resources with other actors.

Building on previous studies, we have attempted to improve and clarify the distinct nature of network capability in relation to existing network constructs, such as network competence, alliance capability, and relational capability. Based on an understanding of NC’s unique characteristics, we define it as *a focal firm’s ability to develop and use a network of actual and potential inter-organisational relationships to gain access to resources held by other actors and the focal firm’s ability to develop these capabilities by integrating parts of the organization, such*

*as units and personnel, to coordinate network resources and create value from partner knowledge.*

The above definition indicates that network capability is a related but distinct construct compared to known network constructs such as network competence, alliance capability, and relational capability. Based on a literature review,<sup>1</sup> we find at least three discernible differences between network capability and related constructs. First, network capability captures the firm's ability to extract value (Hagedoorn, Roijakkers, and Kranenburg 2006) from regional webs of networks of relationships (Vesalainen and Hakala 2014). In contrast, network competence (Sullivan Mort and Weerawardena 2006), alliance capability, and relational capability generally aim to capture abilities that achieve value from single and separate relationships (Draulans, deMan, and Volberda 2003; Ritter 1999). NC is a construct that is more relationally inclusive and based on broader network activity.

Second, network capability focuses on both the strategic and operational levels of the firm, whereas the other constructs focus on strategic concerns at the management level. For example, alliance capability captures competences in an alliance function unit (Kale, Dyer, and Singh 2002; Wang and Zajac 2007), and networking competence and relational capabilities tend to focus on management skills (Lipparini and Sobrero 1994; Ritter, Wilkinson, and Johnston 2002). Networking activities, however, should not be limited to an alliance function or to a few select managers or boundary spanners. Instead, high NC requires knowledge about partners and networking to be spread throughout the entire organization.

Third, networking competence, alliance capability, and relational capability focus on management competence in evaluating or executing tasks in a firm's relationship to another firm (Ritter, Wilkinson, and Johnston 2002; Rodriguez-Diaz and Espino-Rodriguez 2008). Network capability, on the other hand, acknowledges a host of network and relational abilities, including internally communicating networking matters, positioning the firm appropriately in a network, and maintaining existing relationships and engaging in new ones (Hagedoorn, Roijakkers, and Kranenburg 2006). Given these four differentiating characteristics, NC is related but conceptually distinct from similar network constructs and thus calls for specific research attention.

The general conclusion is that NC is multidimensional by nature. In their seminal study, Walter and colleagues (2006) conceptualized that network capability consisted of four components: (1) the firm's activities to coordinate among collaborating firms; (2) the firm's relational skills based on its ability to affect interpersonal exchange; (3) partner knowledge, that is, possessing organised and structured information about collaborating firms and competitors; and (4) the firm's internal communication channels through which it attains organisational learning through partnerships. These components – coordination, relational skills, partner knowledge, and internal communication – are distinct but at the same time support each other. For example, a firm with well-developed relationship skills should be able to access external knowledge, which in turn enables it to enhance its partners' knowledge as well. Likewise, a firm's efforts to coordinate can help it synchronize with different external partners and attain mutual benefits.

These four components describe NC, but only to an extent. Based on previous research and conceptual arguments in the NC literature (Foss 1999; Hagedoorn, Roijakkers, and Kranenburg 2006), we propose that previous authors have overlooked an important aspect related to building new relationships. Both Foss (1999) and Hagedoorn, Roijakkers, and Kranenburg (2006) stressed the need to build new relationships – something that is not

explicitly captured in the above four dimensions. Thus, we propose a new component related to *building new relations*. This component addresses a firm's ability to begin new relationships with potential partners. It captures the relevance of firms being proactive in initiating contacts with new partners, as well as actively constructing and developing its surrounding network. Specifically, we propose two reasons that support including the dimension of building new relationships into the multidimensional scale of NC. First, the value of certain network relationships diminishes as time passes due to the relationship decay phenomena (Burt 2002). This indicates the need to seek new relationships proactively, thus enabling firms to exploit untapped opportunities (Kim and Aldrich 2005), which becomes critical when regions are distant and the company is under tight time constraints (Smallbone and Welter 2012). Second, although using existing network relationships is beneficial, it can have negative effects, such as limiting the company's opportunities to innovate or inducing rigidity (Katila and Ahuja 2002). Building new relationships provides access to a wide range of knowledge resources and creates space for new resource combinations (Schilling and Phelps 2007). Thus, we propose a five-dimensional structure of NC, which has not been evaluated empirically.

Indeed, NC research has not evaluated the factor structure of the NC dimensions systematically. We argue that such a test is necessary and insightful for further NC research. As such, the present research suggests that NC consists of five prominent and empirically distinct dimensions: (1) coordination, (2) relational skills, (3) partner knowledge, (4) internal communication, and (5) building new relationships.

### **Network capability in high-tech companies**

For high-tech organizations, networking capabilities are important because such organizations are usually embedded in networks with other organizations where knowledge and resource sharing is possible (Laursen and Salter 2006; Rothaermel and Deeds 2006; Wales, Parida, and Patel 2013). Networks limited to a region may also limit actors outside the region to gain useful access to what is shared, because the knowledge and resources they share are particular to that region (Welter 2011). For new and small companies, establishing and maintaining organisational performance outcomes in such networks is not a straightforward process; instead, it is an iterative process in which innovation plays a core role (Pesämaa and Salunke 2011). Lumpkin and Dess (2001) defined innovativeness as a tendency to engage in and support new ideas, novelty, and experimentation that lead to developing new products, services, and technologies. We apply this to knowledge-intensive companies in which innovation is an important step to realizing subsequent performance benefits. Thus, we postulate that NC influences performance outcomes indirectly by its influence of organizational innovativeness (Gronum, Verreynne, and Kastelle 2012; Parida and Örtqvist 2015).

Recent studies have indicated the need to pair and develop innovation with networking (Liu 2013; Ozkan-Canbolat and Beraha 2016; Parida, Westerberg, and Frishammar 2012). An important benefit of networking for high-tech firms emerges from having capabilities that ensure that the firm's goals match in persistent developmental processes of success and failures throughout innovation processes (Stringfellow, Shaw, and Maclean 2014). In this regard, it is important to choose suitable partners and manage those relationships; otherwise, networking fails to achieve its main goals (Baum and Oliver 1991; Bradley, Meyer, and Gao 2006; Stuart 2000). From an NC perspective, exchange in networks is a skill that considers

other firms' goals. This means a firm identifies prospective partners using relational skills, establishes and coordinates relationships, and uses and shares resources and competences through procedures to access partner knowledge (Wales et al. 2013). The aim is to drive innovative behaviour jointly.

More specifically, to achieve innovativeness, the fifth NC dimension of building new relationships is of utmost importance. Indeed, not all inter-firm relationships are beneficial unless the firm's own goals are aligned. Some relationships can also be complex and difficult to manage (Anand and Khanna 2000). One strategy involves a firm positioning itself in a network that provides the ability to successfully search for and build new relationships with selective strategic partners (Hagedoorn, Roijakkers, and Kranenburg 2006). This can bring vital knowledge and information that fosters current or future innovative ambitions (Lorenzoni and Lipparini 1999). The ability to identify, maintain, and build new relationships is important in all industries, but the relevance of such an ability is particularly high in technology related industries (Baum, Calabrese, and Silverman 2000; Laursen and Salter 2006; Parida, Westerberg, and Frishammar 2012; Rothaermel and Deeds 2006).

Network capability is thus especially important for small firms and new ventures such as start-ups (Colombo and Piva 2012). In general, start-ups are likely to face more significant risks of failure than established firms. Failure presumably arises from the firms' liability of newness, that is, its lack of relationships and track record, and from having limited in-house resources (Fernhaber and Li 2013). Therefore, these companies rarely have the resources to take necessary risks and engage in proactive actions leading to innovations. Consequently, many scholars believe that building new relationships with partners and the other commonly mentioned NC dimensions provides a platform for small firms and start-ups to enhance their organisational innovativeness. Such dimensions include coordinating activities, relational skills in interpersonal exchange, accessing organised and structured information about their partners, and enhancing the firm's internal communication to facilitate organisational innovation (De Clercq, Dimov, and Thongpapanl 2010; Pittaway et al. 2004; Powell, Koput, and Smith-Doerr 1996). Similarly, for small- and new high-tech firms, the main benefit of NC comes from temporal or long-term access to input for developing technical or commercial resources, as well as the market interface, which such companies have difficulty maintaining through in-house resources (Corsaro et al. 2012; Hoang and Antoncic 2003). As such, the ambition to secure innovation development depends largely on cooperating with partners and the indirect support of NC (Pittaway et al. 2004; Powell, Koput, and Smith-Doerr 1996).

In sum, it is likely that network capability enables a link between different resources among firms within a network, which can result in a higher degree of innovativeness by understanding and addressing customer needs more effectively (Corsaro et al. 2012). Network capability is thus a fundamental construct that secures relationships with partners in networks or alliances, which increases the tendency for innovative behaviour. Thus, we visualize a strong link between NC and innovativeness:

Hypothesis 1: Network capability relates positively to innovativeness.

Furthermore, to examine the possibility of introducing the new NC scale, we operationally tested and compared the four-dimensional NC scale and have suggested a five-dimensional NC scale. The proposed five-dimensional NC scale includes the fifth dimension related to building new relationships, which, as noted, is positively associated with innovativeness. Formally, we state this as follows:



Hypothesis 1a: Network capability (previously a four-dimensional scale) relates positively to innovativeness.

Hypothesis 1b: Network capability (a new five-dimensional scale) relates positively to innovativeness and the effect is more prominent than in the common four-dimensional network capability scale.

### ***Network capability and innovativeness in high-tech companies***

Consistent with previous research, it is reasonable to expect that innovativeness will influence firm performance (Baldwin and Johnson 1996; Deshpandé, Farley, and Webster 1993; Gronum, Verreynne, and Kastle 2012; Mansury and Love 2008). Prior work has found systematic influences on customers, sales, and innovation performance outcomes, because innovative firms tend to develop new customer-centric products in both existing and new markets as they attempt to secure ‘first mover advantage’ (Kerin, Varadarajan, and Peterson 1992; Wang and Ahmed 2004).

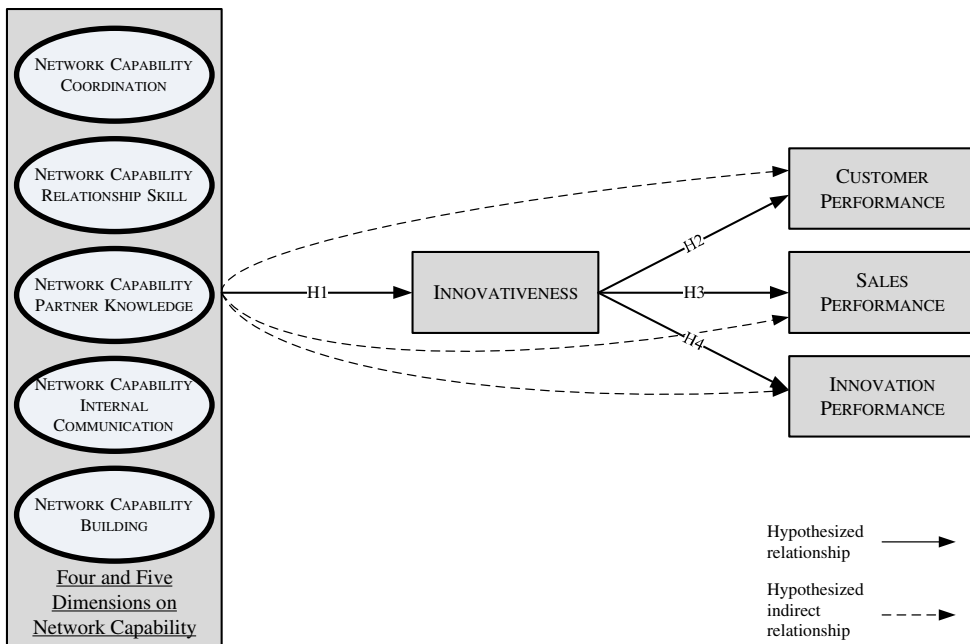
In the present study, we posit that innovativeness is related to customer performance. Walter, Auer, and Ritter (2006) defined customer performance as a firm’s ability to achieve a higher degree of customer satisfaction and retention. This diverse measurement captures performance unrelated to growth or innovation indicators. We argue that innovative firms have a higher tendency to use the search function and understand market trends, which ensures a positive effect on customer performance (Lumpkin and Dess 1996; Prajogo 2006). Moreover, due to their focus on research and development (R&D) activities and their ability to launch new products, these firms tend to maintain intimate relationships with customers to capture their future needs and requirements effectively. This leads to improved chances for customer retention and satisfaction.

Among new- and small high-tech firms, we also posit that organisational innovativeness exerts a positive influence on sales performance, which we define to include growth in terms of expanding existing markets and entering new markets. By focusing on experimenting and technological leadership, firms can develop radical products and services that extend beyond current industrial standards. This leads to increased sales and the potential to capture a larger share of existing markets and perhaps diversify into new markets (Banbury and Mitchell 1995). Innovative behaviour ensures that small firms and new ventures reduce the risk of market failure and outperform the competition through product superiority (Rauch et al. 2009).

Finally, we also posit that the innovativeness of new- and small high-tech firms is linked to higher innovation performance. Innovativeness is distinct from innovation outcomes and innovation performance; indeed, innovativeness captures an organisational behaviour or orientation, whereas innovation performance refers to the measurable effect of developing new methods, processes, products, and services (Wang and Ahmed 2004). These are two well-known constructs and scenarios exist in which innovativeness is not fruitful in terms of innovation performance (i.e. overinvesting in innovative efforts or initiating risky R&D projects). Still, the association is often found to be positive (Gronum, Verreynne, and Kastle 2012; Mansury and Love 2008). Therefore, we expect this to be the case among small firms and start-ups in the high-tech industry.

The above reasoning suggests an indirect rather than a direct influence of network capability on the multidimensional firm performance indicators discussed. The underlying logic





**Figure 1.** Aggregated network capability model with four and five dimensions.

proposes that it is essential to be innovative in taking technological leadership, launching new products quickly, and maintaining continuity in providing novel solutions that lead to higher firm performance (Hoffman et al. 1998; Lumpkin and Dess 1996). According to Gronum, Verreynne, and Kastle (2012, 263), 'the mechanism through which the performance benefits of network translate into firm performance is not always self-evident from research results.' Thus, we argue that organisational innovativeness may be an important construct that enables firms to achieve higher performance through effectively managed network relationships.

Given the aforementioned discussion, we believe it is interesting to research indirect influences of network capability on diverse performance outcomes through innovativeness. We thus formally posit the following three hypotheses for empirical testing:

Hypothesis 2: Network capability influences customer performance through innovativeness.

Hypothesis 3: Network capability influences sales performance through innovativeness.

Hypothesis 4: Network capability influences innovation performance through innovativeness.

### ***Network capability, innovativeness, and performance in high-tech companies***

As with Hypothesis 1, we also build on the possibility of introducing the new NC scale by operationally testing and comparing the four-dimensional NC scale and suggest a five-dimensional NC scale. Support for more significant effects from a broader and more inclusive NC construct can be argued based on prior research, including Kale, Dyer, and Singh (2002), in which they suggest that building new relationships is important for developing an orientation toward being innovative and ultimately developing higher performance in several

aspects. It is vital for firms to achieve network success by integrating strategic and operational thinking in networking matters and ensuring they establish new, long-term relationships. Such a broad perspective of network capabilities has led Kale, Dyer, and Singh (2002) to suggest that firms that had past experience with networking were more capable than firms without previous experience, because the firms had developed networking-oriented routines. Indeed, managing existing networks and potential new network ties is a complex and sometimes challenging task (Olausson and Berggren 2010; Quevedo, Verdu, and Soriano 2011). It is important, however, because it allows the firm to control uncertainty and risks that are necessary for developing an innovativeness-orientation (Tolstoy and Agndal 2010). These risks can be controlled by building new relationships. As such, in networks, firms that strive to take strategic positions to access new and valuable network resources are able to work closely or seek efficiencies that assist them in developing an innovativeness-orientation. This ultimately assists them in extracting performance benefits in customers, sales, and realized innovation. Without network capabilities in building new network relationships, inter-organisational relationships may lead to opportunistic behaviour and long-term loss of efforts and resources in outdated partnerships (Gulati, Nohria, and Zaheer 2000). Formally, we state this for Hypotheses 2, 3, and 4:

Hypothesis 2a: Network capability (previously a four-dimensional scale) influences customer performance through innovativeness.

Hypothesis 2b: Network capability (a new five-dimensional scale) influences customer performance through innovativeness, and the effect is more prominent than in the common four-dimensional network capability scale.

Hypothesis 3a: Network capability (previously a four-dimensional scale) influences sales performance through innovativeness.

Hypothesis 3b: Network capability (a new five-dimensional scale) influences sales performance through innovativeness, and the effect is more prominent than in the common four-dimensional network capability scale.

Hypothesis 4a: Network capability (previously a four-dimensional scale) influences innovation performance through innovativeness.

Hypothesis 4b: Network capability (a new five-dimensional scale) influences innovation performance through innovativeness, and the effect is more prominent than in the common four-dimensional network capability scale.

We tested our proposed construct and hypothesized relationships using two samples in Sweden (small firms and start-ups). Figure 1 illustrates the model that we test in the present study. One sample consists of new technological academic spin-offs; the other sample consists of small but established high-tech companies.

## Research method

### Sample

We used two samples of high-tech firms to test the stated hypotheses. The first survey is a size-stratified sample of approximately 1,500 small, high-tech Swedish firms, which comprises businesses with less than 50 employees. The second survey is a random sample of 1,620 technological start-ups that started their business in the year they were contacted,

representing firms that are fairly young and still in their start-up phase (i.e. less than three years old). We believe that both of these conditions constitute cases in which networking is important and are worthy candidates for examining NC (Parida, Westerberg, and Frishammar 2012; Walter, Auer, and Ritter 2006). In total, 462 responses were obtained, with 291 coming from small firms and 171 from start-up firms. This corresponds to response rates of 21% and 12%, respectively. A nonresponse analysis showed no difference between respondents and nonrespondents for both samples.

### **Measurement**

The operationalisation of NC is based on a refined version of Walter, Auer, and Ritter (2006) research. We selected three items from their study that measure each of the four dimensions (coordination activities, relationship skills, partner knowledge, and internal communication) as inputs for the scale. We changed the wording in some items based on feedback from several pretests. Consistent with the purpose of the present study, we also added the new relationship-building component and measured it using three items. As with the previously validated four dimensions, we pre-tested and refined this measure using both scholars and practitioners before distributing the surveys. We measured innovativeness based on the scale developed by Lumpkin and Dess (2001). Consistent with prior small-firm research, we used a perceived measurement of firm performance, where the respondents rate their performance in relation to their competitors (Walter, Auer, and Ritter 2006). According to Chandler and Hanks (1994), asking firms to evaluate their performance by comparing themselves with their competitors leads to a higher level of reliability and validity. Firm performance consist of three independent constructs reflecting the firm's customer-, sales-, and innovative performance.

### **Preparatory tests and analyses**

In total, our model included nine independent, latent constructs based on 24 observable variables. Table 1 is a brief content-based table, including means and standard deviations. To test the factor structure and subsequently the hypothesized structural model, we used both SPSS Version 20 and AMOS Version 20 for a full-information Structural Equation Modelling (SEM) model.

We performed our analyses in three distinct steps. First, we assessed the psychometric properties of NC to our other constructs to evaluate whether NC consists of five prominent and empirically distinct dimensions (coordination, relational skills, partner knowledge, internal communication, and building new relationships). In this analysis we also tested and ensured that the NC construct is discriminately different from innovativeness and performance outcomes. In a subsequent step, we tested the accuracy of the model's hypothesized relationships and analysed potential differences between samples. Finally, and as presented in the *Results* section, we formally tested Hypotheses 1 through 4.

### **Psychometric assessment of reliability, dimensionality, and construct validity**

Hair et al. (2010) described an assessment process as one fundamental criterion of identifying good measures. This process includes reliability, dimensionality, and construct validity. We

**Table 1.** Descriptives.

		All ( <i>N</i> = 458)		Start-ups ( <i>n</i> = 169)		Small firms ( <i>n</i> = 289)	
		Mean	SD	Mean	SD	Mean	SD
$X_1$	We analyse what we would like and desire to achieve with each partner	1.07	1.42	0.84	1.57	1.21	1.30
$X_2$	We develop relations with each partner based on what they can contribute	1.64	1.26	1.43	1.53	1.76	1.05
$X_3$	We discuss regularly with our partners how we can support each other	1.00	1.44	0.62	1.69	1.21	1.21
$X_4$	We have the ability to build good personal relationships with our business partners	2.01	1.06	1.85	1.29	2.11	0.89
$X_5$	We can deal flexibly with our partners	1.80	1.26	1.59	1.53	1.93	1.05
$X_6$	We almost always solve problems constructively with our partner	1.92	1.06	1.85	1.27	1.97	0.92
$X_7$	We know our partners' markets	1.32	1.27	1.25	1.41	1.36	1.18
$X_8$	We know our partners' products/procedures/services	1.62	1.13	1.61	1.28	1.63	1.03
$X_9$	We know our partners' strengths and weaknesses	1.28	1.19	1.34	1.33	1.25	1.10
$X_{10}$	We have regular meetings for every project	1.09	1.69	0.36	1.83	1.52	1.44
$X_{11}$	Employees develop informal contacts among themselves	1.57	1.41	0.98	1.64	1.91	1.12
$X_{12}$	Managers and employees often give feedback to each other	1.72	1.24	1.50	1.48	1.85	1.06
$X_{13}$	We are constantly open to new relations with new partners	1.87	1.27	1.62	1.46	2.01	1.12
$X_{14}$	We have the ability to initiate a mutual relationship with new partners	1.71	1.29	1.53	1.56	1.81	1.08
$X_{15}$	We have our eyes open to find new partners	1.66	1.41	1.47	1.63	1.77	1.26
$X_{16}$	We have a strong emphasis on R&D, technological leadership, and innovations	0.55	1.99	-0.15	2.20	0.96	1.73
$X_{17}$	Changes in product or service lines have usually been quite dramatic to achieve competitive advantage	0.84	1.80	0.26	2.02	1.18	1.56
$X_{18}$	One of the main goals is to launch many new lines of products/services in next 3 years	0.34	2.10	-0.36	2.23	0.75	1.90
$X_{19}$	Our level of customer satisfaction	1.57	1.04	1.69	1.01	1.51	1.05
$X_{20}$	Our level regarding customer loyalty	1.38	1.05	1.37	0.96	1.38	1.10
$X_{21}$	Our sales growth on established markets	0.68	1.13	0.92	0.98	0.54	1.19
$X_{22}$	Our market growth on new market	0.38	1.16	0.56	1.19	0.27	1.13
$X_{23}$	Our ability to develop new methods and processes	0.76	1.01	0.77	1.01	0.75	1.01
$X_{24}$	Our ability to develop new products and services	0.84	1.07	0.89	0.97	0.82	1.13

followed the same criteria in evaluating the present study's theoretical model using exploratory factor analyses, reliability tests, and SEM-based confirmatory factor analyses. The latter provides a framework to assess theory-driven measurement models and is a rigorous test of construct validity (Anderson and Gerbing 1988).

Cronbach's  $\alpha$  was assessed first for the combined sample and second for each sample separately. The alphas for our first construct, coordination, are  $\alpha = 0.78$  for the combined sample,  $\alpha = 0.79$  for start-up firms, and  $\alpha = 0.74$  for small firms. For our second construct, relationship skills, we report  $\alpha = 0.86$  for the combined sample,  $\alpha = 0.79$  for start-ups and,  $\alpha = 0.74$  for small firms. Third, the construct partner knowledge reported  $\alpha = 0.87$  for the combined sample;  $\alpha = 0.89$  for start-ups, and  $\alpha = 0.86$  for small firms. Fourth, internal communication reached alpha at a level of  $\alpha = 0.76$  for the combined sample,  $\alpha = 0.72$  for start-ups, and  $\alpha = 0.76$  for small firms. Fifth, building new relationships for the combined sample reached alpha at a level of  $\alpha = 0.87$ ,  $\alpha = 0.90$  for start-ups, and  $\alpha = 0.83$  for small firms.

**Table 2a.** Inter-correlation (Psi-matrix) and details for variables (start-ups sample  $n = 169$ ).

	Reliability	1	2	3	4	5	6	7	8	9
1 NC – Coordination	$\alpha = 0.79$									
2 NC – Relationship skills	0.78***	$\alpha = 0.88$								
3 NC – Partner knowledge	0.61***	0.66***	$\alpha = 0.89$							
4 NC – Internal communication	0.54***	0.46***	0.47***	$\alpha = 0.72$						
5 NC – Building Innovativeness	0.57***	0.71***	0.50***	0.42***	$\alpha = 0.90$					
6 Customer Performance	0.41*	0.30**	0.29**	0.35***	0.43***	$\alpha = 0.89$				
7 Sales Performance	0.23*	0.20*	0.15 <sup>N.S.</sup>	0.10 <sup>N.S.</sup>	0.03 <sup>N.S.</sup>	0.01 <sup>N.S.</sup>	$r = 0.62$			
8 Innovative Performance	0.327**	0.02 <sup>N.S.</sup>	0.29**	0.10 <sup>N.S.</sup>	0.14 <sup>N.S.</sup>	0.30**	0.52***	$r = 0.51$		
9 Innovative Performance	0.27**	0.08 <sup>N.S.</sup>	0.23*	0.06 <sup>N.S.</sup>	0.11 <sup>N.S.</sup>	0.45***	0.39***	0.63***	$r = 0.63$	

Notes: In diagonal reliability coefficient Cronbach's alpha ( $\alpha$ ) for 3-item constructs and correlation coefficient ( $r$ ) for 2-item constructs. All variables measured on a Likert scale anchored by –3 and 3.

N.S.  $p > 0.05$  (non-significant), two-tailed tests.

DV = discriminant validity = Intercorrelations  $< 0.9$ .

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Sixth, innovativeness reports that  $\alpha = 0.84$  for the combined sample,  $\alpha = 0.89$  for start-ups, and  $\alpha = 0.76$  for small firms. According to Nunnally (1978), these measures indicate acceptable reliability, as recommended alphas should exceed 0.7. We also acknowledge that reliability can be addressed in alternative ways based on obvious trade-offs with commonly mentioned approaches. Bagozzi and Yi (2012) suggested looking at the correlation coefficient for factors or constructs with less than three indicators/variables/observables. This correlation coefficient tests also indicated robustness, because it is substantial in all three of our performance measures. Beginning with customer performance, we report  $r = 0.62$  for start-ups, and  $r = 0.58$  for small firms. Similarly, for sales performance, we report  $r = 0.51$  for start-ups, and  $r = 0.49$  for small firms. Finally, for innovative performance we report  $r = 0.63$  for start-ups, and  $r = 0.70$  for small firms.

For the NC scale validity test, we conducted exploratory factor analyses (EFA) of all the items included in the study (Hair et al. 2010). Our results from EFA confirm our theoretical factor structure, identifying nine independent constructs (loadings  $> 0.5$ , with a few cross loadings  $< 0.38$ ), which explains 78% of variance. Because we included not just one, but all constructs, this also offers strong evidence of Harman's single-factor test (Harman 1976), which ensures we do not have problems with common method biases with the key variables in the present study (Podsakoff et al. 2003).

The constructs in the full model were subjected to CFA with SEM. Goodness-of-fit reports how well the observed data fit our theoretical model. In SEM models, we report factor loadings for each proposed construct and intercorrelations (Tables 2a and 2b). We find support for convergent and construct validity in loadings and goodness-of-fit reports. Bagozzi and Yi (2012) recommended that loadings exceed 0.6, a variance extracted score  $> 0.50$ , and composite reliability statistic  $> 0.7$ . We found support for sufficient loadings criteria in our CFA, because each construct had loadings between 0.66 and 0.88 in the start-ups sample and between 0.65 and 0.88 in the small firm sample.

We used SEM with maximum likelihood estimation to evaluate further the measurement quality. Our first test ran the same model across both samples with all of the parameters free

**Table 2b.** Inter-correlation (Psi-matrix) and details for variables (small firms sample  $n = 289$ ).

	Reliability	1	2	3	4	5	6	7	8	9
1 NC – Coordination	$\alpha = 0.74$									
2 NC – Relationship skills	0.65***	$\alpha = 0.83$								
3 NC – Partner knowledge	0.66***	0.52***	$\alpha = 0.86$							
4 NC – Internal communication	0.45***	0.35***	0.31***	$\alpha = 0.76$						
5 NC – Building Innovativeness	0.49***	0.61***	0.49***	0.30***	$\alpha = 0.83$					
6 Customer Performance	0.18*	0.20**	0.16*	0.36***	0.36***	$\alpha = 0.76$				
7 Sales Performance	0.17*	0.18*	0.22**	0.17*	0.14*	0.22**	$r = 0.58$			
8 Innovative Performance	0.38***	0.21**	0.29***	0.38***	0.32***	0.36***	0.36***	$r = 0.49$		
9 Innovative Performance	0.13 <sup>N.S.</sup>	0.16*	0.22**	0.19*	0.29***	0.47***	0.42***	0.50***	$r = 0.70$	

Notes: In diagonal reliability coefficient Cronbach's alpha ( $\alpha$ ) for 3-item constructs and correlation coefficient ( $r$ ) for 2-item constructs. All variables measured on a Likert scale anchored by –3 and 3.

DV = discriminant validity = Inter correlations < 0.9.

N.S.  $p > 0.05$  (non-significant), two-tailed tests.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

to establish model fit to the observed data. The goodness-of-fit are reported as follows: normed  $\chi^2$ , Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Residual (SRMR). The CFI indices  $\geq 0.90$ , RMSEAs  $\leq 0.08$ , and SRMRs  $\leq 0.08$  indicate good model fit between observed data and the theoretical model (Bagozzi and Yi 2012). Because  $\chi^2$  is sensitive to sample size, these indices are less sensitive to sample characteristics. Our model supported the same nine-factor structure with similar loadings across both samples and acceptable model fit ( $\chi^2 = 736.952$  [df = 432]; normed  $\chi^2 = 1.706$ ;  $p$  value = 0.000; CFI = 0.940; RMSEA = 0.039; and SRMR = 0.044).

We also tested metric invariance by constraining the factor loadings of the indicators to equality across the start-up and small firm samples. This procedure also resulted in acceptable fit ( $\chi^2 = 749.412$  [df = 447]; normed  $\chi^2 = 1.677$ ;  $p$  value = 0.000; CFI = 0.941; RMSEA = 0.039; and SRMR = 0.044). The  $\chi^2$  difference between the simple structure model and the equal-loading model (12.460; 12 df) was not significant ( $p > 0.05$ ). Hence, we rejected the unconstrained simple structure model in favour of the constrained one. Factor loadings were equal (invariant), indicating improbable metric issues (Bagozzi and Yi 2012).

Finally, we tested factor invariance by constraining variances. The model yielded  $\chi^2 = 833.290$  (df = 477); normed  $\chi^2 = 1.747$ ;  $p$  value = 0.000; CFI = 0.930; RMSEA = 0.040; and SRMR = .060. The  $\chi^2$  difference between this model and the simple structure model was significant ( $p < 0.05$ ; [ $\Delta\chi^2 = 96.339$ ; 45 df]) indicating differences in factors. As a result, we expect differences in what can be explained between the two samples, which we present in the *Results* section.

## Results

We performed a set of empirical tests to estimate influences on innovativeness, customers, sales, and innovative performance. Specifically, we separated the effects of the four-dimension and the five-dimension network capability constructs to test the effect of the four dimensions of network capability (Table 3(a): H1a–H4a) and to compare this effect to a five-dimension model of network capability (Table 3(b): H1b–4b). Our goal was ultimately

to detect differences between the four- and five-dimension models and to verify whether a fifth dimension adds any explanatory power to the previously used four-dimension scales. As such, Table 3(a) and (b) report findings from SEM for the combined-, start-up-, and small-firm samples. Consistent with our discussions, we also report indirect mediation effects in these tables.

Starting with the first hypothesis, H1a is supported for all three samples (Table 3(a); combined:  $\beta = 36$ ,  $p < 0.001$ ; start-up:  $\beta = 0.39$ ,  $p < 0.001$ ; small firms:  $\beta = 0.23$ ,  $p < 0.001$ ). As expected, our five-dimension model adds explanatory power to innovativeness (H1b), which has slightly more support across all samples (Table 3(b); combined:  $\beta = 0.39$ ,  $p < 0.01$ ; start-up:  $\beta = 0.42$ ,  $p < 0.01$ ; small firms:  $\beta = 0.28$ ,  $p < 0.01$ ). Explained variance ( $R^2$ ) is also higher.

Next, we test H2a (innovativeness  $\rightarrow$  customer performance). Hypothesis 2a is identical across the four- and five-dimension models, which implies it is only significant for our small firm sample (Table 3(a); combined:  $\beta = 0.08$ ,  $p > 0.05$ ; start-up:  $\beta = 0.02$ ,  $p > 0.05$ ; small firms:  $\beta = 0.16$ ,  $p < 0.01$ ). While testing indirect mediation effects, we confirm marginally significant standardized indirect effects for small firms (Table 3(a); small firms:  $\beta = 0.04$ ,  $p > 0.01$ ) and nonsignificant indirect effects for the other two samples. In reporting results for H2b, a slight difference is found for the five-dimension model (Table 3(b); combined:  $\beta = 0.10$ ,  $p > 0.05$ ; start-up:  $\beta = 0.04$ ,  $p > 0.05$ ; small firms:  $\beta = 0.18$ ,  $p < 0.01$ ) with a significant standardized indirect effect for small firms (Table 3(b); small firms:  $\beta = 0.02$ ,  $p < 0.01$ ) and nonsignificant for the other two samples. Hypothesis 3a returned similar results for our four- and five-dimension models with minor differences in mediation effects. Our four-dimension model for H3a (Table 3(a); combined:  $\beta = 0.19$ ,  $p < 0.001$ ; start-up:  $\beta = 0.25$ ,  $p < 0.001$ ; small firms:  $\beta = 0.26$ ,  $p < 0.001$ ) reports a significant standardized indirect mediation effect (Table 3(a); combined:  $\beta = 0.07$ ,  $p < 0.01$ ; start-up:  $\beta = 0.10$ ,  $p < 0.01$ ; small firms:  $\beta = 0.05$ ,  $p < 0.01$ ). Our results from the five-dimension model for H3b (Table 3(b); combined:  $\beta = 0.20$ ,  $p < 0.001$ ; start-up:  $\beta = 0.26$ ,  $p < 0.001$ ; small firms:  $\beta = 0.28$ ,  $p < 0.001$ ) report significant standardized indirect mediation effects (Table 3(a); combined:  $\beta = 0.08$ ,  $p < 0.01$ ; start-up:  $\beta = 0.10$ ,  $p < 0.01$ ; small firms:  $\beta = 0.04$ ,  $p < 0.01$ ). The findings are slightly higher for the five-factor NC model. Finally, the results for Hypothesis 4 clearly show that our four- and five-dimension models report some differences in mediation effects. Our four-dimension model for H4a (Table 3(a); combined:  $\beta = 0.35$ ,  $p < 0.001$ ; start-up:  $\beta = 0.38$ ,  $p < 0.001$ ; small firms:  $\beta = 0.38$ ,  $p < 0.001$ ) reports a significant standardized indirect mediation effect (Table 3(b); combined:  $\beta = 0.12$ ,  $p < 0.01$ ; start-up:  $\beta = 0.15$ ,  $p < 0.01$ ; versus small firms:  $\beta = 0.09$ ,  $p < 0.01$ ). The findings show slightly improved results from a five-dimension model in the test of H4b (Table 3(b); combined:  $\beta = 0.36$ ,  $p < 0.001$ ; start-up:  $\beta = 0.39$ ,  $p < 0.001$ ; small firms:  $\beta = 0.39$ ,  $p < 0.001$ ) with significant standardized indirect mediation effects (Table 3(b); combined:  $\beta = 0.14$ ,  $p < 0.01$ ; start-up:  $\beta = 0.16$ ,  $p < 0.01$ ; small firms:  $\beta = 0.06$ ,  $p < 0.01$ ). Overall, the explained variance is higher for the five-dimension NC construct. In particular, innovativeness reports a significantly higher  $R^2$ , ( $p < 0.001$ ) suggesting some, although limited, support for a five-dimension network capability construct.

## Discussion and conclusions

### *Theoretical contribution*

We find that network success supports firms that cross regional borders and exploit new product domains (Brekke 2015). In this light, NC skills play a significant role. Here, we test a short version of a new NC scale and empirically examine a suggested network



**Table 3.** Test of structural model.

Hypothesized relationship	Standardized beta (t-values)		
	Combined samples	Start-ups	Small firms
<i>(a) Four dimensions</i>			
H1a: NC → INN	0.36*** (8.12)	0.39*** (5.42)	0.23*** (4.01)
H2a: INN → CP	0.08 <sup>N.S.</sup> (1.71)	0.02 <sup>N.S.</sup> (0.29)	0.16** (2.66)
H3a: INN → SP	0.19*** (4.13)	0.25*** (3.33)	0.26*** (4.60)
H4a: INN → IP	0.35*** (7.94)	0.38*** (5.33)	0.38*** (6.93)
<i>Std. Indirect effect</i>			
N → INN → CP	0.03 <sup>N.S.</sup>	0.01 <sup>N.S.</sup>	0.04**
NC → INN → SP	0.07**	0.10**	0.05**
NC → INN → IP	0.12**	0.15**	0.09**
R <sup>2</sup> INN	12.6%	14.9%	5.3%
R <sup>2</sup> CP	0.6%	0.0%	2.4%
R <sup>2</sup> SP	3.6%	6.2%	6.8%
R <sup>2</sup> IP	12.1%	14.4%	14.3%
Goodness-of-Fit: $\chi^2 = 51.80$ ; df = 9; p value = 0.000; $\chi^2/DF = 5.76$ ; CFI = 0.93; RMSEA = 0.072; SRMR = 0.052			
* $p < 0.05$ ; ** $p < 0.01$ ; *** $p < 0.001$ N.S. $p > 0.05$ (non-significant) Regression coefficients shown are beta coefficients			
<i>(b) Five dimensions</i>			
H1b: NC → INN	0.39*** (9.14)	0.42*** (5.95)	0.28*** (4.97)
H2b: INN → CP	0.10 <sup>N.S.</sup> (1.73)	0.04 <sup>N.S.</sup> (0.33)	0.18** (2.70)
H3b: INN → SP	0.20*** (4.15)	0.26*** (3.35)	0.28*** (4.64)
H4b: INN → IP	0.36*** (7.94)	0.39*** (5.40)	0.39*** (6.98)
<i>Std. Indirect effect</i>			
NC → INN → CP	0.03 <sup>N.S.</sup>	0.09 <sup>N.S.</sup>	0.02**
NC → INN → SP	0.08**	0.10**	0.04**
NC → INN → IP	0.14**	0.16**	0.06**
R <sup>2</sup> INN	15.5%	17.4%	7.9%
R <sup>2</sup> CP	0.6%	0.0%	2.4%
R <sup>2</sup> SP	3.6%	6.2%	6.8%
R <sup>2</sup> IP	12.1%	14.4%	14.3%
Goodness-of-Fit: $\chi^2 = 47.11$ ; df = 9; p value = 0.000; $\chi^2/DF = 5.24$ ; CFI = 0.94; RMSEA = 0.068; SRMR = 0.048			
* $p < 0.05$ ; ** $p < 0.01$ ; *** $p < 0.001$ N.S. $p > 0.05$ (non-significant) Regression coefficients shown are standardized beta coefficients (t-values)			

capability–innovativeness–performance relationship across two high-tech samples. Our hypotheses suggest that NC will be important for several aspects of performance for new- and small high-tech firms by improving their level of organisational innovativeness. More specifically, the present study makes four key theoretical contributions to network literature.

First, we turn to our empirical findings and confirm the most important aspect. Our  $R^2$  in the aggregated five-dimension construct on NC and innovativeness is higher compared to the four-dimension construct. Although the difference is not substantial, it is significant and explains the importance of including the dimension of building new relationships when examining start-ups and small firms. Because the results seem to affect start-ups more than established small high-tech firms, a richer network scale may provide important insights for certain samples. At an early stage, start-ups may search for advice and assistance (Rothwell 1991). Small firms in contrast can routinely orient themselves through and within existing networks. Network relationships thus help start-ups reduce uncertainty and risk associated with business opportunities (McAdam and McAdam 2008).

Next, we turn to our scale and acknowledge that examining the ability to manage external relationships has become an emerging focus within network research (Anand and Khanna

2000; Lipparini and Sobrero 1994; Ritter and Gemünden 2003; Wang et al. 2014). Research on network capability, however, has not evolved as expected due to its similarities with other network research constructs such as network competence (Ritter 1999), alliance capability (Kale, Dyer, and Singh 2002), and relational capability (Lorenzoni and Lipparini 1999). Based on our literature review, we identified three discernible differences: (1) a focus on entire network relationships, suggesting a more relationally inclusive view; (2) a focus on both strategic and operational activities and issues; and (3) a conceptualized view that includes diverse network and relational abilities. Thus, we argue that NC is a conceptually different network construct, which calls for unique research attention to understand its role and effects on performance in greater depth.

The third issue emerging from our findings deals with examining the existing scale for NC. The predominant conceptualization of NC, primarily built on Walter, Auer, and Ritter (2006), as a four-dimension construct includes coordination activities, relational skills, partner knowledge, and internal communication routines. In the present study, we propose an overlooked critical dimension of NC related to building new relationships. This addition introduces a dynamic view to NC conceptualization, which acknowledges that gaining value from network relationships also depends on a firm's ability to begin new relationships with potential partners (Foss 1999; Hagedoorn, Roijakkers, and Kranenburg 2006). The importance of building new relationships is particularly important for high-tech firms, because they are always looking for innovations to secure competitiveness. Our empirical analysis shows that the new scale has adequate measurement properties. The factor analyses showed five distinct dimensions for both samples (small firms and start-up firms), suggesting that the measurement works very well. Considering that we only measured each of the five dimensions with three items (with little or no opportunity to exclude items), the measurement outcome is more than satisfactory. We did this in response to a call by Ritter and colleagues (2002) for a shortened version of the NC scale, which was tested across multiple samples. Thus, based on our systematic analysis and revision of the NC multidimensional scale, we make a significant contribution to advance network research.

Finally, we found few empirical studies that have connected NC to performance models, with the exception of Walter, Auer, and Ritter (2006) and Hagedoorn, Roijakkers, and Kranenburg (2006). Across our high-tech samples, we found significant support for a revised NC construct as a strong antecedent to innovativeness, which ultimately leads to high performance outcomes. As explained, variance is higher, which suggests that organisational innovativeness is an important mechanism through which high-tech firms can unravel the benefits of networking. For resource-constrained high-tech firms, NC provides access to resources, knowledge, and the competence of external partners (Nooteboom, Coehoorn, and Der Zwaan 1992; Pittaway et al. 2004). Such resources drive internal efforts to explore new technological ideas and experimentation and, in the process, positively influence organisational innovativeness (Laursen and Salter 2006; Pirolo and Presutti 2010). The present study's results indicate that innovative firms that can commercialize new products and services on a regular basis should maintain higher market competitiveness compared to non-innovative firms (Gronum, Verreynne, and Kastle 2012). In particular, high-tech firms with a strong focus on innovativeness also secure higher performance outcomes, such as customer performance, sales performance, and innovation performance. For example, network-enabled firms work closely with local suppliers, with their partners, and with their customers to develop products that are not only novel but also synchronized with the

customers' and the markets' needs (Vesalainen and Hakala 2014), leading to higher sales growth. This further implies that in the context of the high-tech industry, the need to be innovative is of utmost importance. Indeed, small firms and new ventures can largely mitigate market uncertainty and dynamism when they effectively use their NC to benefit from external relationships. Thus, our empirical findings explain in detail the mechanisms through which performance outcomes are derived from NC; indeed, they suggest that organisational innovativeness should be regarded as an intermediate outcome that links networking elements to performance outcomes.

In conclusion, we initiated the present study to develop a network capability scale and to examine the effects of NC dimensions on innovativeness and performance outcomes in two samples. More specifically, we develop the NC measurement while adding a previously neglected NC dimension – network relationship building – and analyse its effects on various outcomes, while controlling for the previously used four-dimension NC scale. Adding a new dimension means including a dynamic aspect; that is, a network capability in locating and building new relationships rather than merely managing and sustaining existing relationships. Our analysis supports that an NC's effect on performance is indirect, although organisational innovativeness, based on aggressive, firm-level experimentation, involve actively replacing old ideas, products, and product lines. Such organizational innovativeness is manifested in firm-level strategic behaviour. This behaviour element strongly depends on the firm's ability to use network relationships effectively to secure future competitiveness.

### ***Practical implications***

For managers and CEOs of small firms and new ventures in the high-tech industry, we highlight three key implications. First, compared to other capabilities, NC represents an important holistic organisational capability for small and new firms, which extends the responsibility of maintaining external relationships beyond selected individuals. Second, along with an enhanced ability to coordinate relationships and build partner knowledge, possessing relational skills, engaging in internal communication, and building new relationships are also critical to consider, because they open up possibilities for small firms and start-ups to disengage from unproductive relationships and identify new business opportunities. Such networking activities are particularly relevant and constructive for high-tech firms, because they are operating in dynamic environments where proactive distance search efforts are often necessary to drive innovation and performance. Finally, small firms and start-ups in the high-tech industry must strongly emphasize the need to drive innovation, given that we find a strong correlation between innovativeness and performance. This largely depends, however, on the productive use of networking to drive innovation-based competitiveness. Thus, the benefits of NC are connected significantly to driving innovativeness, which in turn unlocks diverse performance effects.

### ***Limitations and suggestions for future research***

The present study has several limitations that need to be considered when interpreting the results. First, the proposed dimension of building new relationships works well as an additional component of the NC scale, but we had little leeway to exclude any items because we only included three items per dimension. The intent from the start was to develop a short

scale for NC. Still, future studies should develop an extended, comprehensive, multidimensional scale for NC, which would add to the scale's robust nature. Second, operating in a high-tech industry represents specific dynamics related to a greater focus on mitigating uncertainty and the need to adapt continuously to changing market demands. Under such conditions, a firm's ability to use NC to drive innovativeness represents the key to higher performance. Such innovation-based competitiveness, however, should be examined further in non-high-tech industrial settings. Thus, care should be exercised when applying our results beyond the high-tech industry. Third, although we have used two diverse samples, they are still cross-sectional. We encourage future studies to use longitudinal data, which will add to our understanding with far more fine-grained details regarding the proposed relationship. Fourth, we have proposed innovativeness as a central mediator that unlocks the positive effects of NC and drives performance. However, other potential mediators or moderators need to be considered and examined to understand the relationship among networking, innovativeness, and performance in greater detail.

## Note

1. The literature review included a search in four literature search engines: SCOPUS, EBSCO, JSTOR, and the ISI search engines.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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