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The role of network governance in business model performance

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Abstract

This study examines the role of network governance in business model performance. Prior research on network governance has focused on power, structures and coordination mechanisms. However, interorganizational networks are strategic resources that can potentially be shaped by managerial action that is not based on hierarchical status or absolute power, or direct controlling, but on indirect influence and persuasion. The thesis of this study is that from the managerial perspective, network governance should be redefined to be more relational than structural, to include both leadership and management functions, and to focus on the capabilities that enable competitive advantage in networks. The study provides a conceptual model in order to analyze the contingent effects of business model choices and network governance on firm performance. The hypotheses and model are validated with empirical data on business model and network governance in the software industry. The data suggest that network governance has a mediating role in the business model–firm performance relationship.

Keywords: Business model, interorganizational networks, governance, software industry

Introduction

The importance of networks has increased greatly during the last decades (Hagedoorn and Osborn, 1997; Pettigrew and Fenton, 2000; Ireland et al., 2002; Hoffmann, 2007). Networks have been widely recognized by both scholars and practitioners as an important form of multi-organizational governance (Goerzen, 2007; Provan and Kenis, 2008). Many industries, especially the high-technology industries (Rothaermel and Deeds, 2006), are using the network form of governance to coordinate and commercialize complex products or services in uncertain and competitive environments more than ever (Park, 1996; Mitchell and Singh, 1996; Jones et al. 1997; Blankenburg Holm et al., 1999; Lorenzoni and Lipparini, 1999; Swaminathan and Moorman, 2009). As a result, firms today are embedded in a dense network of interorganizational relationships with customers, suppliers, competitors, and complementors (Jones et al., 1997; Hoffmann, 2007). These relationships are considered to generate significant benefits in terms of industry structure,

positioning within an industry, and in the inimitable resources and competencies that are gained (Hung, 2002).

A fundamental question in strategy research is why firms differ in their conduct and profitability (Gulati et al., 2000; Dyer and Hatch, 2006). In general, investing in relationships contributes to firm performance (Ireland et al., 2002), and understanding the effect of interorganizational networks on business performance has become topical for both managers and scholars (Dyer and Singh, 1998; Madhavan et al., 1998; Gulati et al., 2000; Goerzen and Beamish, 2005). Strategic alliances and networks have been gaining popularity with many firms for their lower overhead costs, increased responsiveness and flexibility, and greater operational efficiency. Hence, interorganizational networks are now recognized as an important source of competitive advantage (Jarillo, 1988; Grandori and Soda, 1995; Gulati et al., 2000; Ireland et al., 2002; Dyer and Hatch, 2006; Nosella and Petroni, 2007; Watson, 2007); goal-oriented relationship management and value flows in these networks play decisive roles in company performance (Kandemir et al., 2006; Rothaermel and Deeds, 2006; Hoffmann, 2007). However, network governance from the relational management perspective, instead of structural perspective, remains an under-investigated phenomenon (Ireland et al., 2002; Goerzen, 2007).

Another focus in recent strategy research is the design of superior business models (e.g., Schweizer, 2005; Johnson et al., 2008; Zott and Amit, 2008; Mason and Leek, 2008). Patzelt et al. (2008) submit that business models define the ways in which firms manage their transactions with customers, partners, investors and suppliers and therefore constitute the organizations' architecture for the product, service, and information flows. Bearing this notion in mind, Zott and Amit (2008) introduce the firm's business model as a contingency factor that captures the structure of a firm's boundary spanning operation and influences firm performance. Mason and Leek (2008), in turn, argue that firms are confronted with the challenge of learning how to develop and manage interorganizational networks in relation with business models. Hoffmann (2005) also connects networks and business models by showing that firms adopt relationship-related strategies that are an integrative part of the business strategies of the firm and that define the basic principles of managing networks. Yet, research lacks knowledge of how managing networks, which are subject to the firm's business model design, influence that firm's performance.

This paper addresses the need for managing networks in business models. Specifically, the study draws upon the resource-based view (RBV) and network governance theories to theorize about what constitutes network governance from the management point of view and how it affects a firm's business model performance. The argument here is that network

governance plays a key role in the success of the firm's business model. Because of the unique nature of interorganizational networks, assessing their performance effects has been elusive (Park, 1996; Goerzen, 2007) suggesting that a feasible performance measurement should be concentrated on a focal firm in the network. However, most research on networks can be characterized by two network-level structural approaches: the micro-level "network analytical" approach and the macro-level "network as a form of governance" approach, both of which are limited when it comes to analyzing a firm's functioning and governance of networks from the management perspective (Provan and Kenis, 2008). In network analytical approaches the main objective is either to describe, explain, or compare relational configurations such as network density, or to use these configurations to explain certain outcomes. Thus, this paper establishes a framework that redefines network governance from the managerial action view to consist of leadership and management functions and their respective capabilities. The framework is validated using quantitative empirical data (N=197) on the governance of interfirm collaboration (as a part of the firms' business model) in the software industry. Several scholars (e.g. Lavie, 2007; Swaminathan and Moorman, 2009) suggest that software industry provides a good context for investigating firm networks and their management due to its dynamic and knowledge-intensive nature.

The paper is structured as follows. After this introductory section, a literature review on the theoretical foundation of business models and network management is offered. Moreover, hypotheses drawing on the extant literature are formulated. Thereafter, the research design, measures, data analysis and the key results are presented. Finally, the paper is concluded by discussing the implications derived from the study.

Theoretical background and hypotheses

The benefits of networking are receiving greater emphasis in research and practice (Ireland et al., 2002). A widely used approach to the issue is the resource-based view (RBV) that examines strategic capabilities as a pool of internal resources which are strategically important for the creation of competitive advantage (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993; Amit and Schoemaker, 1993). The RBV suggests that the combination of a unique collection of resources within a single firm will create synergies leading to sources of sustained competitive advantage (Barney, 1991). Thus, the search for competitive advantage has focused on the resources and capabilities that are housed within the firm (Gulati, 1999; Dyer and Hatch, 2006). However, Ireland et al. (2002) point out

that few firms have all of the resources needed to compete in the current dynamic landscape, making firms seek access to resources through alliances and networks. This insight is emphasized in the relational view of strategic management (Dyer and Singh, 1998; Gulati et al., 2000), which expands the unit of analysis from an individual firm or a single dyadic relationship to include the focal firm and all its interorganizational relationships (Hoffmann, 2007). Interfirm networking provides firms with access to the information and knowledge that contribute to superior adaptation to their competitive environments (Ireland et al., 2002). Hence, interorganizational networks are important sources of resources and capabilities, learning, and thereby competitive advantage.

An interorganizational network consists of a vast range of interfirm relations (Nassimbeni, 1998). Provan et al. (2007) note that organizational scholars usually discuss networks, even the term “network” is not always used; many who study business, community, and other organizational networks prefer to talk about partnerships, strategic alliances, interorganizational relationships, coalitions, cooperative arrangements, or collaborative agreements. The terminology varies, but Thorelli (1986) stresses that networks generally comprise firms that are involved in long-term relationships. That being said, Nassimbeni (1998) defines “networks” by arguing that they are constituted by two or more firms, at least in part autonomous, which give rise to an exchange relationship. Conversely, Provan and Kenis (2008) provide a definition by focusing on groups of three or more legally autonomous organizations; they may be self-initiated, by network members themselves, or may be mandated or contracted, but work together to achieve their own and a collective goal. The present study shares the view of Provan et al. (2007) who make no effort to offer an all-encompassing definition of networks, but focuses on a network consisting of multiple organizations linked through multilateral ties in ways that facilitate achievement of a common goal. What differentiates the interorganizational network from vertically integrated organizations is the independence of member organizations in a network (Park, 1996).

Network governance

Governance is a key aspect of interest in research on interorganizational networks (Provan et al., 2007). To begin with, Provan et al. (2007) suggest distinguishing a network construct as a perspective from networks as a form of governance. Networks are typically viewed as mechanisms of coordination, or by what has often been referred to as network governance (Grandori and Soda, 1995; Provan and Kenis, 2008). Many scholars (e.g., Park, 1996; Pittaway et al., 2004) however, argue that an institutional arrangement to control and

manage interfirm collaboration is a key factor in the success and failure of networks, and that there are different types of networks and governance needs. For example, Provan and Kenis (2008) distinguish between serendipitous networks that develop opportunistically and goal-directed networks that are set up with a specific purpose. According to Provan et al. (2007), goal-directed networks must be governed if they are to be effective. Managing relationships is crucial for firms to gain competitive advantage and create value with networks (Ireland et al., 2002) and the care of network relationships should be a priority for management (Jarillo, 1988). However, although relationship management has been shown to affect the network's success (Ireland et al., 2002), network governance theory remains focused on structures and relations and is silent on crucial management practices. Unlike most organizations, networks must be governed without benefit of hierarchy or ownership (Provan and Kenis, 2008). To his point, Dhanaraj and Parkhe (2006) pose the question: how does a firm coordinate, direct, influence, and manage networks of actors?

Network governance is a complex phenomenon that is growing in importance but poorly understood (Jones et al., 1997). For example, Ritter et al. (2004) point out that the research focus in interorganizational networks is shifting from structures and governance to managing business networks and relationships. Networks are a strategic option that firms can use to pool and deploy partners' resources to compete in the marketplace. Provan et al. (2007) concur, adding that by discussing governance in terms of what mechanisms are used to govern the network and observe that a fraction of research takes a managerial approach on how to design, manage, and control networks in order to reduce uncertainties and improve competitiveness. Consequently, recent research (see e.g., Young and Dulevitz, 2008; Hoetker and Mellewigt, 2009), conceptualizes network governance from the managerial perspective as the effective and efficient use of the interorganizational network infrastructure and resources and skills of its members. The ability to govern networks is a dynamic capability that enables a firm to integrate, build and reconfigure internal and external competences to adapt to rapidly changing environments (Rothaermel and Deeds, 2006). To govern the complexity embedded in network relationships so that firms achieve their desired benefits and strategic objectives is a managerially challenging and costly endeavor (White and Lui, 2005) and firms need to possess network capabilities (Kandemir et al., 2006). However, Ritter et al. (2004) pose a dilemma: since networks are loosely coupled systems, to what extent are business networks manageable?

Provan et al. (2007) identify three distinct forms of governance within networks. Governance, including strategic and operational decisions, may be (1) shared and undertaken collectively; (2) the responsibility of a more powerful "center" (Lorenzoni and

Baden-Fuller, 1995), “lead-organization” (Siu and Bao, 2008), or “hub-firm” (Jarillo, 1988), or be (3) coordinated through an organization specifically created to oversee the network. These forms are related to configuration of governance structure and address who is responsible for managing (Provan et al., 2007). Managerial ways may differ because of differences in power, network position and resources. Hence, Young and Dulewicz (2008) wonder what governance mechanisms are shared by actors hoping to influence or manage networks, as they would explain how network behavior can be directed and translated into tangible outcomes such as firm performance. The idea draws upon the notion by, e.g., Rothaermel and Deeds (2006) who suggest that those firms that engage in effective network management should be able to achieve higher benefits from the network. Hagedoorn et al. (2006) and Swaminathan and Moorman (2009) add that the capability to form and manage networks is relevant in all industries but particularly in rapidly evolving high-tech industries, and that network capabilities indicate the capacity of a firm to act as a strategic player that is capable of creating an efficient network of partnerships. According to Wathne and Heide (2004), the literature on networks proposes governance mechanisms and networking capabilities that predominantly represent either an incentive design or the actor qualification aspect.

Leadership and management

According to Young and Dulewicz (2008), two contrasting yet complementary functions combine to form governance: leadership and management. Governance pertains to decisions that define expectations, grant power, or verify performance, and consists either of a separate process or of a specific part of leadership or management processes. In the late 1970s, significant thinking about the concepts of leadership and management emerged among organization researchers and it was proposed that these two functions had different characteristics and purposes and they require different capabilities. For example, Zaleznik (1977) suggests that the nature of management is rational and systematic, whereas leadership is the achievement of change through inspiring and motivating others. Kotter (1990) adds that leadership and management have many similarities, because both require determining what should be performed, designating people to carry out the tasks, and ensuring that the task is accomplished. Based on that view, Birch (1999) sees that as a generalization, management is concerned with tasks while leadership is concerned with people. Considering this notion in the interfirm context, one could use “organizations” instead of “people.” Whilst it may not be easy to differentiate between the two, it seems clear that both effective leadership and management functions are necessary in network governance.

Leadership means above all motivating, guiding and developing others (Paolillo, 1981) and is thus a salient aspect of the organizational context (Yanagida, 1992). Leadership is also associated with coping with change, establishing and communicating a vision, setting directions and strategies to achieve the vision, and with motivating and inspiring staff. Most definitions of leadership involve a process of influencing (e.g., Yukl, 1989) which can be understood as persuading others to follow (Young and Dulewicz, 2008). Motivation is even suggested to account for most of leadership (de Man and Roijackers, 2009) together with persuasive action (Young and Dulewicz, 2008) and both are associated with the ability to influence (Young and Dulewicz, 2008). Network leaders possess these capabilities and influence the network toward obtaining a particular result. They help to establish compatibility between the network and its members (Yanagida, 1992) by building common network-level goals based on the goals and roles of individual actors (Kogut, 1988; Nosella and Petroni, 2007; de Man and Roijackers, 2009). They create a vision and mobilize others to fulfill that vision by integrating resources and skills across organizational boundaries. (Lorenzoni and Baden-Fuller, 1995). Lorenzoni and Lipparini (1999) emphasize that the ability to integrate internal and external resources and the efforts of different actors is as important for firm as is the capacity to innovate. In sum, the key capabilities needed for the leadership function of network governance include the ability to influence other actors and to integrate those actors and their resources.

Management may be described as the ability to use material and systems to best effect (Zaleznik, 1977). Several scholars (e.g., Birch, 1999; Young and Dulewicz, 2008) claim that management is associated with heterogeneous skills and tasks such as coping with complexity, planning and budgeting, developing processes and procedures, controlling, monitoring and attending to staffing issues. Following the notion by Ireland et al. (2002), the mandate for network governance is broad, but calls for coordination of activities throughout the network. Coordination has especially to do with the way the network optimizes its operation (de Man and Roijackers, 2009) and network leaders should coordinate the structure, resources and activities so that knowledge is funneled to the actors in the operation that most need it (Lorenzoni and Baden-Fuller, 1995; Kandemir et al., 2006; Nosella and Petroni, 2007). However, prior work on interfirm relationships (e.g., White and Lui, 2005) highlights the difficulty of effective coordination of interdependent tasks. Consequently, Provan and Kenis (2008) stress that network governance requires the use of structures of authority and collaboration to allocate resources and to coordinate and control joint action across the network. The purpose of control is to cause behaviors and outcomes to conform to existing goals, strategies and objectives via the help of monitoring co-operative activities (Yanagida, 1992; Tsoukas, 1994; Park, 1996; Birnberg, 1998;

Sundaramurthy and Lewis, 2003). To sum up, key capabilities required in the management function of network governance comprise the coordination of resources and activities and control of the actors and their activities.

Business models

Business model innovations have reshaped entire industries and redistributed billions of dollars of value (Johnson et al., 2008). Hence, business models are an interesting topic for practitioners and strategic management researchers. That being said, the conceptualization and definition of the business model of a firm has turned out to be challenging. One way to approach the concept is to look at firms' tangible outcomes and their antecedents. Because the business model encompasses competitive advantage, it draws on resource-based theory (Barney et al., 2001). For example, Christensen (2001) argues that the business model of a firm can be a source of competitive advantage that is distinct from the firm's product market position. Similarly, Zott and Amit (2008) claim that the business model, as a source of value, can help explain why some firms outperform others; it provides a rationale for both value creation and appropriation. The business model can also be defined as the structure, content, and governance of transactions between the focal firm and its exchange partners (Amit and Zott, 2001). Therefore, the business model is a structural template of how a focal firm transacts with customers, partners, and vendors in order to create and capture value.

The business model is related to but distinct from a number of managerial concepts. For example, Morris et al. (2005) contend that the business model is not a strategy but consists of numerous strategy elements, and the business model construct builds upon central ideas in business strategy and its associated theoretical traditions. Similarly, it is not an activity set, although activity sets support each element of a business model; at the operational level, the model represents an architectural configuration, where the focus is on processes and design of infrastructure that enables the firm to create value (Morris et al. 2005). This positions the concept of business model between the strategy and processes. In fact, according to Chesbrough and Rosenbloom (2002), the business model is a conceptual tool; it makes the strategic choices that characterize a venture explicit and is hence the abstraction of the everyday business (Morris et al., 2005). The business model provides a coherent framework that takes technological characteristics and potential as inputs, and converts them through customers and markets into economic outputs (Chesbrough et al., 2006). In this vein, any action to alter business model design affects the firm's possibilities for value creation and value capture (Amit and Zott, 2001) and it can be used as a

managerial tool for capturing, sharing and realizing strategic intent (Mason and Leek, 2008).

Business models are compounds of elements that describe the key aspects of the business. According to Johnson et al. (2008), a business model consists of four interlocking elements that, taken together, create and deliver value: customer value proposition, profit formula, key resources, and key processes. They are interdependent, and major changes to any one of these four elements affect the others and the whole. Furthermore, Amit and Zott (2001) state that business models can be classified according to the design of these elements. Regarding the elements, customer value proposition and the profit formula define value for the customer and the company (Johnson et al., 2008). Offering, as the manifestation of value proposition, solves the problem or fulfills the needs and is defined not only by what is sold but also by how it is sold (Johnson et al., 2008). Key resources and processes, in turn, describe how that value will be delivered to both the customer and the company. As business models also connect firms' product development and customer needs (Chesbrough and Rosenbloom; 2002), customer relationship is an important factor in defining how the value proposition is developed. It should be noted that other classifications exist (see e.g., Morris et al., 2005) but focus in a similar manner on the elements that create value for both the customer and the company, and explain the interaction of those elements.

Johnson et al. (2008) describe interorganizational networks as a key resource of the firm and thus of its business model. Chesbrough et al. (2006) point out that a number of successful firms take significant time to develop their networks. Mason and Leek (2008) submit that business models are conceptualized as the emergent outcomes of preconceived network structures built through the development of routines that guide problem solving, because the business model defines how firms manage their transactions with other organizations and constitute the organizations' architecture for the product, service, and information flows (Patzelt et al., 2008). The business model in fact creates an architecture that affects a wide variety of actors and their investments (Chesbrough et al., 2006). Hence, the business model has to be managed and developed over time (Hedman and Kalling, 2003) and an understanding of the interdependencies between value creation and value appropriation in networks is essential: how business models and network governance are linked and what their influence on firm profitability is (Hoffman, 2007; Lavie, 2007). In terms of the firm's fit within the value creation network, the business model relates to strategic network theory (Morris et al., 2005) and is linked to the discussion on network governance. The importance of network governance in business models is stressed by

Chesbrough et al. (2006), as networks create and convert the potential value of a technology into realized value in the market.

Hypotheses

Network governance facilitates the integration of multiple autonomous, diversely skilled parties under intense time pressures to create complex products or services. Two elements of the business model thus take precedence over the others: the offering and the customer. According to Thorelli (1986) and Jones et al. (1997), offerings that are developed in close collaboration with the customer may bind a firm tighter into its network than if the firm offers mainly standardized offerings. Furthermore, Jones et al. (1997) submit that demand uncertainty pushes firms toward disaggregation, whereas customer proximity in the form of customized, human asset-specific exchanges intensifies the need for integration among parties. Moreover, exchanges with high levels of human asset specificity and customer involvement require an organizational form that enhances cooperation, proximity, and knowledge transfer among parties, thereby demanding coordination (Jones et al., 1997). Conversely, Dyer and Hatch (2006) point out that network constraints constitute a potential barrier to knowledge transfer especially in the case of customized offerings that are co-created with the customer. Such constraints may include the lack of good network governance. Both Paolillo (1981) and Eisenhardt (1989) argue that a critical role for good network governance is to monitor and control the behavior of actors who run the operation in the network, and Chesbrough et al. (2006) propose that profitable business models draw upon controlling and monitoring of cost-effectiveness and impacts, as well as activities in the firm network. Monitoring enables the firm to learn from experience and develop best practices for future initiatives. Hoetker and Mellewigt (2009) suggest that coordination and monitoring of physical assets and activities, and learning from people in interorganizational relationships, are related to proximity in relationships. As a logical consequence, this notion provides a rationale to suggest that customer proximity increases the need for network governance. Hence,

H1a: Customer proximity has a direct positive relationship with network leadership

H1b: Customer proximity has a direct positive relationship with network management

As a firm's propensity to enter networks is related to the resource endowments of the firm (Park et al., 2002), the importance of possession of or access to key resources in the network becomes obvious when firms aim to develop new products and business concepts (Mitchell and Singh, 1996). However, Chesbrough et al. (2006) suggest that the design of new technologies and business and offering packages promotes both control procedures

and coordination in the network. Especially, product uniformity fosters interorganizational exchange. Having articulated the value proposition in terms of the product or service offering for the customer and the business, companies must consider the key resources and processes needed to deliver that value. For a packaged products company, i.e. a firm focusing on standard offerings, strong brands and well-selected channel retailers might be the key resources, and associated brand-building and channel-management processes among the critical processes. These may be seen as a challenge for both the leadership and management functions of network governance. Jones et al. (1997) define network governance as consisting of a select, consistent, and structured set of autonomous organizations engaged in creating (standard) products or services based on implicit and open-ended contracts to adapt to environmental contingencies and to coordinate and safeguard exchanges. Thus,

H2a: Product uniformity has a direct positive relationship with network leadership

H2b: Product uniformity has a direct positive relationship with network management

Networking is regarded as a means of obtaining business results (Yanagida, 1992) as a firm is embedded in a network of ongoing business and non-business relationships, which both enable and constrain its performance (Ritter et al., 2004). For example, Watson (2007) found that networking is significantly positively associated with firm survival and growth, and Swaminathan and Moorman (2009) show that in the software industry, business networks produce firm value and suggest managing networks as a key factor for a firm's future success. In addition, according to Provan and Kenis (2008), network governance has impact on network effectiveness; Dyer and Hatch (2006) show that effective knowledge transfer regarding operation and best practices contributes to firm performance. Similarly, Hoffmann (2007) argues that from the perspective of strategic management the impact of interorganizational relationships on the performance of a focal company is of central importance. All in all, performance requires the governance of activities (Provan et al., 2007; Hoetker and Mellewigt, 2009) and networks that are strategically governed are often fast-growing and on the leading edge (Lorenzoni and Baden-Fuller, 1995).

The notions are further supported by, e.g., Hoetker and Mellewigt (2009), who argue that both formal and relational governance mechanisms are needed in alliance governance. By formal mechanisms they refer to the coordination and monitoring of physical assets and activities, and by relational mechanisms they mean the cultivation of ties with people and learning and utilizing the knowledge-based assets embedded in relationships. Hoetker and Mellewigt (2009) add that a firm should choose the appropriate mechanism by the type of the assets. According to Mitchell and Singh (1996), who studied the effects of firms'

market performance on their interorganizational networks in the hospital software systems industry, organizational choices significantly affect organizational survival; both development-oriented (with product focus) and marketing-oriented (with customer focus) collaborative relationships and interactions contributed to firms' market performance. Thus, a well-managed network can offer companies the opportunity to gain long-term competitive advantages and added value, and the success of the lead company and of the other companies in the network are usually tied together (Nosella and Petroni, 2007). The ability to manage interactions in networks effectively is also critical for reaching economic goals (Ritter et al., 2004). Therefore,

H3: Network leadership has a direct positive leadership with firm performance

H4: Network management has a direct positive leadership with firm performance

Methodology and data

For the purposes of the study, an online survey of software firms' strategies, business models and innovation approaches was conducted in early 2009. The empirical inquiry was administered to all software firms in Finland. The procedure to acquire the contact information of the firms in the sampling frame was fourfold. First, the names and contact information of firms that belong either to the Association of the Finnish Software Entrepreneurs or the Finnish Software Business Cluster were obtained. Second, the names and e-mail addresses of the senior managers in those firms were collected from the companies' web sites. Third, the contact list was completed using the standard industrial classification of Statistics Finland, selecting all firms in the category of software consultancy and supply (TOL 2002 – 722). Finally, the contact information of combined list of the senior managers of firms included in the sampling frame was mined from the nationwide electronic telephone catalogue. After cross-validation, duplicate records referring to the same managers were eliminated.

The total sample consisted of 2549 potential respondents. The respondents were recruited via e-mail messages containing an invitation and a link to the survey. After two waves, the questionnaire yielded 197 usable responses for the analysis. Thus, the response rate is approximately 8% which is considered acceptable for online surveys targeted to nationwide whole sampling frames covering all firms in the selected industry. Respondents' demographic information was collected for control purposes. Following the standard industrial classification (SIC; Dun and Bradstreet), firms in the sample were

classified according to the number of employees into micro firms (fewer than 5 employees); small firms (5-19 employees); small to medium-sized firms (20-99 employees); medium-large firms (100-499 employees); and large firms (500 or more employees). Using this classification, the distribution of firms in the sample is shown in Table 1.

Table 1 Distribution of firms in the sample by size (N=197)

Category	Frequency	Percent	Valid %	Cumulative %
Fewer than 5 employees	45	22.8	23.0	23.0
5-19 employees	67	34.0	34.2	57.1
20-99 employees	48	24.4	24.5	81.6
100-499 employees	17	8.6	8.7	90.3
500 or more employees	19	9.6	9.7	100.0
Total	196	99.5	100.0	
Missing	1	0.5		
Total	197	100.0		

The majority of firms in the sample are considered small to medium sized in terms of the number of employees; more than 80% of the firms have fewer than 100 employees. In addition, 25% of the firms had an annual turnover of less than 0.5 MEUR, 50% of the firms have annual turnover with less than 1.6 MEUR, and 75% with less than 8 MEUR. The turnover of the largest firm equals 4500 MEUR. The distribution of both the number of employees and turnover in the sample is consistent with previous research on Finnish software industry (e.g. the annual software business surveys 2001-2008).

Estimating non-response bias

A critical concern is if the results from a study can be generalized into a larger population. Based on the extensive address database derived from multiple sources, an invitation to survey was sent to 2549 potential respondents representing 1355 software business firms. It can be claimed that these include almost of the software firms in Finland. Hence, although the response rate of 8% is seemingly small (197 respondents out of 2549 potential in two waves), in fact response was gained from 179 different companies out of 1355, which means that more than 13% of Finnish software firms were covered by the

survey. In addition, for the purposes of estimating non-response bias (as suggested by, e.g., Armstrong and Overton 1977), a third wave of responses was received later via an additional reminder, raising the total number of respondents to 298. The data from the additional 101 respondents was used for the non-response bias check, which showed no significant difference between later respondents and those from earlier waves. However, with all three waves included, 258 firms out of 1355 would amount to a 19% representation of Finnish software industry, thus permitting reasonable grounds for generalization to the population.

Variables

Multi-item scales were used to measure all constructs. The survey addressed software firms' business models, network governance, and firm performance. All items were measured on a five-point Likert-type scale (1="strongly disagree" to 5="strongly agree"). The scales for business model focus and network governance were developed for the study on the basis of a literature review and interviews with the senior managers of 15 software firms. The wording in the questionnaire was slightly modified to fit with the software industry context. Because objective measures are not available, the study relies on the respondents' perceptual measures. However, although information regarding the dependent and independent variables comes from the same respondents, and a common method bias exists, it is unlikely that the bias would have a remarkable influence on the analysis.

Dependent variable. The dependent variable is firm performance. This draws upon the notion by Rothaermel and Deeds (2006), who stress that if interorganizational relationship management capabilities exist, they must have tangible, observable benefits such as direct or indirect performance effects. In analyzing the determinants of firm performance it is imperative to begin with a definition of "performance" (Watson, 2007). According to Young and Dulewicz (2008), in the context of governance involving both leadership and management, performance should be assessed holistically. Thus, it should be overall performance that does not point out simple average of individual performance grades and dimensions. Moreover, Thorelli (1986) stresses that networks bring to the fore both long- and short-term benefits. Therefore, firm performance (PERF) is a second-order construct investigated in terms of perceived benefits concerning market performance and financial performance. Market performance is usually associated with long-term effects whereas the implications for financial performance are linked with short-term effects. Market performance (MPERF) is a reflective construct consisting of three items drawn from prior literature. Specifically, the items measure (y_{18}) the growth of a firm's market share

(Thorelli, 1986; Kandemir et al., 2006), (y_{19}) the firm's perceived effect on fostering overall market development (Kandemir et al., 2006) and (y_{20}) whether the firm has been able to grow faster than its competitors during the previous three years (Jaworski and Kohli, 1993). Consequently, financial performance (FPERF) is a reflective construct which consists of three items used to investigate firms' short-term economic success. These items measure whether the firm has been able to (y_{21}) lower its operating costs (Park, 1996; Ritter et al., 2004), (y_{22}) increase its profitability (Patzelt et al., 2008), and (y_{23}) increase its sales (Thorelli, 1986; Kandemir et al., 2006) during the last three-year period.

Independent variable. The independent variable is firms' business model. In this vein, the present study follows the guidelines set by, e.g., Patzelt et al. (2008) who studied business model performance using business model as an independent variable and firm performance as a dependent variable. The present study focuses on the firm's business model as the independent variable affecting the functions of network governance as intermediary variables and, ultimately, firm performance as the dependent variable. This is considered in terms of customer orientation and standard offering orientation. Customer proximity (CUST) is measured by investigating (x_1) if the customers participate in the solution design work (Venkatraman and Henderson, 1998; Syam and Kumar, 2006; Evans and Webster, 2007), (x_2) whether the development work is carried out in close collaboration with customers (Venkatraman and Henderson, 1998; Syam and Kumar, 2006), (x_3) whether product development is based on need specifications made in collaboration with customers (Venkatraman and Henderson, 1998; Syam and Kumar, 2006; Evans and Webster, 2007), and (x_4) the firm's extent of enhancing its extant customer relationships (McKenzie and Hardy, 1996). Product uniformity (PROD) is measured by (x_5) the degree of standardization of offerings when delivered to customers (Venkatraman and Henderson, 1998; Syam and Kumar, 2006), (x_6) whether the firm's solutions are assembled as a standard product or service entity (Venkatraman and Henderson, 1998; Syam and Kumar, 2006), (x_7) the firm's focus during the last three years to develop new (packaged) products and/or services (Syam and Kumar, 2006), and (x_8) if the firm emphasizes developing (standard) products and services new to the industry (McKenzie and Hardy, 1996).

Intermediary variable. The intermediary variable is network governance, reflected by its leadership and management functions. Leadership function (LEAD) is a second-order construct compounding of two types of governance capability: influencing and integrating. The items of influencing (INF) measure the firm's (y_1) activity in motivating the other network members in order to commit them to the network goals (Young and Dulewicz, 2008; de Man and Roijackers, 2009), (y_2) efforts to activate partnerships and establish new

joint activities (Hagedoorn et al., 2006; Kandemir et al., 2006), (y₃) persuasive action in order to guide the network members' operation towards a favorable direction (Young and Dulewicz, 2008), (y₄) actions to convince the other network members of the value and benefits of collaboration (Yanagida, 1992; Siu and Bao, 2008), and (y₅) communication and dissemination of information concerning the network collaboration (Paolillo, 1981; Powell et al., 1998; Ryals and Humpries, 2007). The items of integrating (INT) measure the firm's (y₆) attempt to find partners that possess an adequate level of skills and competences for collaboration (Siu and Bao, 2008), (y₇) duty to combine network resources with its internal resources (Thorelli, 1986; Lavie, 2007; Siu and Bao, 2008), (y₈) obligation to align individual goals of the network members with those of the whole network (Sundaramurthy and Lewis, 2003; Winkler, 2006; Nosella and Petroni, 2007; de Man and Roijakkers, 2009), and (y₉) key role in suggesting and approving new product and service development roadmap (de Man and Roijakkers, 2009).

Management function (MGNT) is a second-order construct consisting of two first-order constructs: coordination and control capabilities. Coordination (COOR) was measured by (y₁₀) the firm's key role in planning work and activity of the whole network and its members (Young and Dulewicz, 2008), (y₁₁) whether the firm coordinates the structure and operation of the whole network (Lorenzoni and Baden-Fuller, 1995; Kandemir et al., 2006; Nosella and Petroni, 2007), (y₁₂) the firm's effort in optimizing the network and its operation as a whole (de Man and Roijakkers, 2009), and (y₁₃) if the firm ensures by determining procedures and operational rules that the network operates in a harmonized way (Nosella and Petroni, 2007; de Man and Roijakkers, 2009). Finally, the items of controlling (CTRL) measure if the firm (y₁₄) periodically monitors the network members' activities, behavior and decisions (Park, 1996; Sundaramurthy and Lewis, 2003; de Man and Roijakkers, 2009), (y₁₅) systematically reviews the network's operation in order to evaluate the quality of the joint activity (Kandemir et al., 2006), (y₁₆) directs the operation by pointing out on a continual basis the expectations and goals, so that the partners become aware of the future direction and what is expected of them (Heimeriks et al., 2009), and (y₁₇) directs the network's operation for future initiatives to match with best practices (Chesbrough et al., 2006; Heimeriks et al., 2009).

Scale validity and reliability

The present study uses Wold's (1982) method of partial least squares (PLS) to estimate parameters. First, it was ensured that the dataset of 197 firms meets the guideline of five respondents per indicator (see Bentler and Chou, 1987), which is essential for the method.

Second, to address common method variance (CMV), which can be a problem when both dependent and independent variables are measured in the same survey, the study used Harman's one-factor test. Factor analysis revealed seven factors with an eigenvalue greater than one. Together they explain 64 per cent of the total variance, and the first factor explains 17 per cent. Because no single factor explains most of the variance, CMV is unlikely to be a concern with the data (Podsakoff and Organ, 1986). Third, to assess the reliability and validity of the constructs, composite reliability values (ρ_c) and average variance extracted values (ρ_v) were examined for each first-order latent variable. Construct reliability was assessed using composite reliability analysis as suggested by Fornell and Larcker (1981). It can be written using calculation formula:

$$(1) \quad \rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \text{var}(\varepsilon_i)}$$

where λ_i is an individual factor loading and $\text{var}(\varepsilon_i)$ is its error variance. All composite reliability values were above the recommended level of .70 (Fornell and Larcker, 1981). A complementary measure to composite reliability is the average variance extracted, which is useful in examining convergent validity. The average variance extracted is the average variance shared between a construct and its measures (Hulland, 1999) and the equation is defined as:

$$(2) \quad \rho_v = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum \text{var}(\varepsilon_i)}$$

where the ρ_v is computed as the total of all squared standardized factor loadings. It shows directly the amount of variance captured by the construct in relation to the variance due to measurement error. In our study, all constructs exceeded the recommended .50 benchmark (Diamantopoulos and Siguaw, 2000). Overall, the composite reliability values and average variance extracted values indicate that the scales perform adequately. In addition to these two measures, Table 2 shows the means, standard deviations, Cronbach's alphas for internal consistency for all latent constructs, and correlations for the first-order constructs.

Second-order constructs

PLS enables scholars to investigate models at a higher level of abstraction (Lohmöller, 1989) which is useful in estimating complex models (Chin et al., 2003). For this purpose, Wold (1982) suggests the repeated indicators (i.e., the hierarchical component model) method for measuring second-order constructs. In other words, all indicators of the

first-order constructs are reassigned to the second-order construct, as second-order models are a special type of PLS path modeling that uses manifest variables twice for model estimation. According to Hulland (1999), the researcher needs to consider whether it is more correct to think of the underlying construct as causing the observed measures (a reflective relationship) or of the measures as causing or defining the construct (a formative relationship). However, a prerequisite for the repeated indicators approach is that all indicators of the first-order and the second-order factors are reflective. According to Jarvis et al. (2003), such a model is called a “total disaggregation second-order factor model.” It has a series of first-order latent factors with reflective indicators and these first-order factors are themselves reflective indicators of an underlying second-order construct. Thus, all items included in the present PLS analysis were configured as reflective indicators (Fornell and Larcker, 1981; Haenlein and Kaplan, 2004).

Discriminant validity is the extent to which difference constructs diverge from one another. It was assessed by examining the correlation matrix of the constructs. According to Fornell and Larcker (1981), satisfactory discriminant validity among constructs is obtained when the square root of the average variance extracted is greater than corresponding construct correlations. This implies that the variance shared between any two constructs is less than the variance shared between a construct and its indicators. For each pair of first-order constructs, the square root of the average variance extracted exceeded their correlations. Thus, all constructs meet the criterion, supporting the discriminant validity of the constructs.

Table 2 Construct correlations and descriptive statistics of measures (n=197)

Construct	Mean	SD	ρ_v	ρ_c	α	1	2	3	4	5	6	7	8
1 INF	3.59	.77	.68	.91	.88	.88	(.82)						
2 INT	3.57	.70	.57	.84	.75	.62	(.76)						
3 COOR	3.06	.79	.68	.90	.85	.66	.62	(.83)					
4 CTRL	3.38	.69	.63	.87	.80	.53	.59	.60	(.79)				
5 MPERF	3.30	.95	.71	.88	.79	.29	.28	.33	.25	(.84)			
6 FPERF	3.34	.74	.57	.79	.62	.33	.32	.29	.33	.57	(.75)		
7 CUST	3.91	.71	.54	.82	.74	.33	.34	.22	.26	.14	.30	(.73)	
8 PROD	3.56	.81	.53	.82	.70	.33	.29	.34	.19	.38	.32	.05	(.73)
9 LEAD (Second-order: 1-2)	-	-	.80	.89	.88	-	-	-	-	-	-	-	-
10 MGNT (Second-order: 3-4)	-	-	.80	.89	.87	-	-	-	-	-	-	-	-
11 PERF (Second-order: 5-6)	-	-	.79	.88	.80	-	-	-	-	-	-	-	-

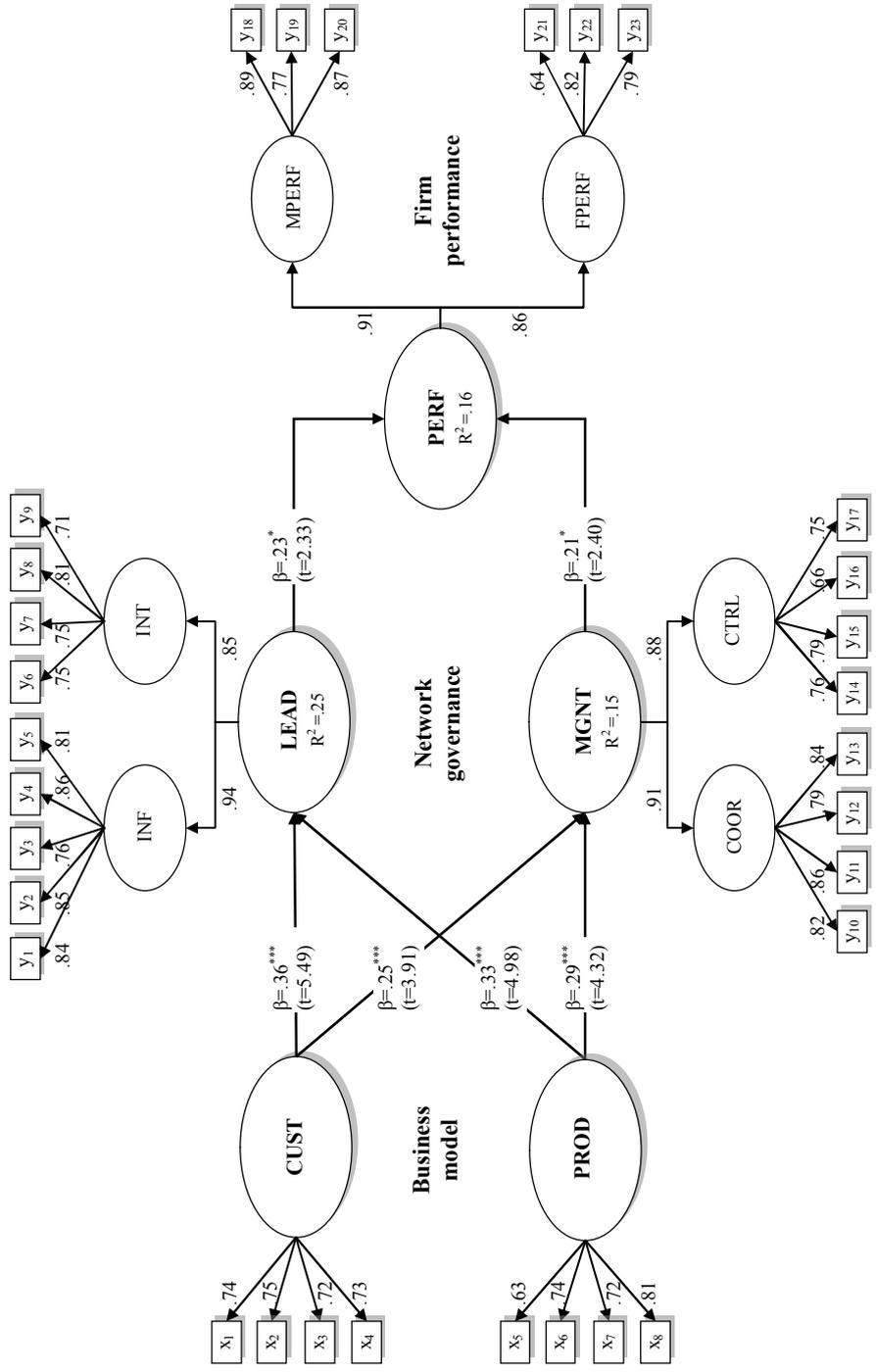
Note: SD = standard deviation; ρ_v = average variance extracted; ρ_c = composite reliability; Cronbach's alpha (α) = $((\sum_{i=1}^p \text{cov}(x_{i1}, x_{i1}))/\text{var}(\sum_{i=1}^p x_{i1}))^{1/2}$ (Tenenhaus et al., 2005); square root of ρ_v on diagonal (in parentheses).

Empirical analysis and results

Hypotheses were tested using the SmartPLS 2.0 developed by Ringle et al. (2005). PLS path modeling is a component-based SEM approach that does not require multivariate normal data and places minimum requirements on measurement levels (Hulland 1999; Tenenhaus et al. 2005). The advantages of PLS include the ability to model multiple dependents independents, the ability to handle multicollinearity among the independents, robustness in the face of missing data, and the creation of independent latents directly on the basis of cross-products involving the response variables (see e.g., Chin et al., 2003; Haenlein and Kaplan, 2004). Moreover, because PLS considers all path coefficients simultaneously and estimates multiple individual item loadings in the context of a theoretically specified model rather than in isolation, it helps to avoid biased and inconsistent parameter estimates for equations. Finally, PLS is appropriate when the research model is in an early stage of development (i.e. the model is predictive in nature) and has not been tested extensively (Barclay et al., 1995; Teo et al., 2003), as is the model in the present study. Because a review of the literature indicated that empirical tests of network governance and business model-performance relationships are sparse, the focus of the study was on theory development. Hence, PLS was the appropriate technique for the research.

Both hypotheses were examined with full-sample using t-tests ($df=490$). SmartPLS 2.0 was used to perform structural equation modeling and to evaluate both quality of the measurement model and the interrelationships of the constructs of the structural model. PLS estimates both the measurement model and structural model at the same time. First, it generates estimates of standardized regression coefficients for the paths in a structural equation model. Then, it implements a bootstrap technique to determine the significance of the structural paths. The bootstrap procedure approximates the sampling distribution of an estimator by resampling with replacement from the original sample, which is necessary to derive valid t-values. The analysis was conveyed using 1000 bootstrap replications as suggested by Davidson and MacKinnon (2000) and Tenenhaus et al. (2005). Structural equation model and the results of the analysis are illustrated in Figure 1.

The explanatory power of the model for the dependent construct was measured by using the squared multiple correlations value (R^2). As PLS does not provide overall fit indexes for the model, Hulland (1999) emphasizes that researchers should report R^2 values for all endogenous constructs included in their models. In the present study, the independent constructs were able to explain 25% of the variance in the leadership dimension and 15% of the variance in the management dimension of network governance. Overall, the model explained 16% of the variance in firm performance, which is considered acceptable for this kind of analysis.



Note: * $p < .05$, *** $p < .001$

Figure 1. Structural model of the study

PLS path modeling includes no proper single goodness-of-fit measure. However, to conclude our structural analysis, the goodness of fit (GoF) of the model was calculated using Tenenhaus et al.'s (2005) global fit measure for PLS. By taking the square root of the product of the variance extracted of all constructs with multiple indicators and the average R^2 value of the endogenous constructs, it is possible to calculate a fit measure ranging between 0 and 1. According to the categorization by Cohen (1988) and using .50 as a cut-off value for communality (Fornell and Larcker, 1981), the GoF criteria for small, medium, and large effect sizes are .10, .25, and .36. In the present model, the GoF is .35, which indicates a medium to large effect, and, thus, a good fit of the model to the data.

Table 3. Results of hypotheses testing (n=197, bootstrap samples=1000, df=490)

H#	Relationship	Coefficient	t-value	p-value	Support
H1a	CUST → LEAD	.36	5.49	<.001	Yes
H1b	CUST → MGNT	.25	3.91	<.001	Yes
H2a	PROD → LEAD	.33	4.98	<.001	Yes
H2b	PROD → MGNT	.29	4.32	<.001	Yes
H3	LEAD → PERF	.23	2.33	<.05	Yes
H4	MGNT → PERF	.21	2.40	<.05	Yes

Table 3 lists the results for the hypotheses. As predicted in hypotheses H1a and H1b, a software firm's customer proximity as a dimension of the firm's business model has a direct positive relationship with network governance in terms of leadership function ($\beta=.36$, $t=5.49$, $p<.001$) and management function ($\beta=.25$, $t=3.91$, $p<.001$) of the governance. That is, focusing customer proximity in the software development triggers the firm to conduct leadership-type managerial action including influencing and integrating the other actors and their resources in the business network. In addition, firms' customer proximity initiates management-type action that consists of coordination and controlling the other actors' resources and their activities. Conversely, the results of the analysis suggest that a software firm's product uniformity in the form of standardized, homogeneous offerings aimed at multiple customers, has a direct positive effect on business network governance consisting of leadership ($\beta=.33$, $t=4.98$, $p<.001$) and management ($\beta=.29$, $t=4.32$, $p<.001$) functions, as anticipated in hypotheses H2a and H2b. Hence, provision of offerings with a high degree of standardization as a key focus of the firm's business model stimulates both leadership and management aspects of business network governance. Furthermore, the analysis shows that network governance mediates the link between the firm's business

model and its performance measured by both market performance and financial performance. More specifically, leadership ($\beta=.23$, $t=2.33$, $p<.05$) and management ($\beta=.21$, $t=2.40$, $p<.05$) functions of network governance have direct positive effects on a firm's business model performance. Therefore, the analysis provides support to hypotheses H3 and H4. In general, these findings support the arguments that both the firm's business model and network governance in the interorganizational network context are important predictors of its performance.

Discussion and Conclusion

This study offers evidence on the contribution of network governance to business model performance. Specifically, the study draws upon the resource-based view (RBV) and network governance theories to investigate what is network governance from the management point of view and how it affects a firm's business model performance. The study develops the traditional concept of network governance, focusing on structures, relations and coordination mechanisms of network organizations with a view that deals with the design and management practices in networks. Network governance is conceptualized as the effective and efficient use of an interorganizational network infrastructure and the resources and skills of its members. Therefore, to govern the complexity embedded in network relationships and to gain both individual and collective benefits that constitute a competitive advantage, the firm should develop and possess managerial networking capabilities.

Traditionally, network governance has been considered mainly a structural construct, with less emphasis on relational aspects, especially from the management point of view. This paper continues to advance the research on interorganizational relationships and networks and their management by establishing a framework that redefines network governance from the management perspective to consist of two juxtaposing functions, leadership and management, and reveals the capabilities required by both. In brief, management involves power by position and direct control, whereas leadership involves power by motivation and indirect influence. Hence, capabilities required by leadership involve an ability to influence the other actors and an ability to integrate all actors and their resources in the network. Similarly, the management function of network governance requires capabilities that enable a firm to coordinate the resources and activities performed by members of the network, and an ability to control activities at the network level. It should be noted that the presented forms of network governance are somewhat rooted to the traditional

management functions of hierarchical management, significantly amended to fit interfirm networks.

The findings demonstrate that network governance has a mediating role in the business model–firm performance relationship. A business model provides a contingency factor that captures the structure of a firm’s boundary-spanning operation and influences firm performance. At the same time, it is a structural template of how a focal firm transacts with customers, partners, and vendors in order to create and capture value. The business model is a conceptual tool that positions itself between the firm’s strategy and processes; thus it reflects the firm’s everyday business and reveals its design of certain competitive value creation and appropriation elements. Prior research (e.g., Johnson et al., 2008) provides various classifications of these elements, but the present study highlights two elements over the others: the offering and the customer. The former is a manifestation of the firm’s value proposition, whereas the latter describes the way in which value is delivered and captured. Consequently, the study operationalizes these elements as the constructs reflecting firms’ product uniformity and customer proximity, and links them with network governance. The empirical results show that both customer proximity and product uniformity have direct positive effects on the leadership and management functions of network governance, and, ultimately, to the firm’s long-term market performance and short-term financial performance.

In conclusion, this study contributes to the research on interorganizational networks and their management. A fundamental proposition of the paper is that networking and systematic network governance through management functions is crucial for a firms’ success. The results reported in this paper provide empirical support for this proposition. The reasoning for the argument is that it is unlikely that organizations can master all the key competencies they need, and networks are an important source of resources, learning, and thereby competitive advantage. Thus, firms seek access to the necessary resources outside their organizational boundaries (Nassimbeni, 1998) through interorganizational networks (Ireland et al., 2002). Moreover, prior research (e.g., Dyer and Hatch, 2006) shows that network resources have a significant influence on firm performance. Nevertheless, according to the typical view in prior research, network governance focuses structures and coordination mechanisms and thus helps to strategically optimize the position of the focal company in the interorganizational field and to improve its financial performance. In this vein, performance is seen strongly influenced by power and control.

This study advances the traditional view by arguing that any member in the interorganizational network may become a leader at any time by taking indirect and direct

managerial actions that cause the others to alter their operation and lead to modifications in the network entity. Hence, networks and especially network governance should be seen as more of a relationship management activity than as a competitive mechanism. Moreover, the study contributes to both strategy and network research by establishing a link between the business model of a firm and interorganizational network as a key part of it, and by suggesting that competitive advantage in such networks depends on the firms' ability to govern their networks simultaneously through motivation and power. The findings and contribution of the present study is in line with hints given by Pettigrew and Fenton (2000) who claim that in the modern organization, bipolar managerial concepts and forces take place simultaneously and the firm is faced with the "managing dualities" challenge. By the same token, firms are expected to "live with and manage both hierarchies and networks," "standardize and customize [their] innovations," and "achieve greater (short-term) performance accountability and ensure [their] (long-term) continuity" (Pettigrew and Fenton, 2000).

Future research may extend this study in several ways. First, it may test the findings in different industries or countries. The present study investigates the role of network governance in business model performance in the Finnish software industry. Although volatile high-technology industries are suggested to fit well for the research of business strategy and networking because of their rapidly evolving technology and partnering needs, and thus the software industry provides a good research context for this study, other industries might show different results. Similarly, Finland is a small Scandinavian country with a cultural context where management may take a more indirect form in comparison to some other countries and cultures, thus the emphasis in network governance given the management perspective may be different. Furthermore, as the present study advocates that any firm may actively manage its network relationships regardless of an obvious hub position, future research could investigate whether the degree of a firm's activity in network governance might, in fact, culminate in a central position in the network.

Regarding the conceptualization of the business model of a firm, it would be interesting to investigate what effects network governance has on the business model performance when they are operationalized through other elements of the business model. Although offering focus in terms of product uniformity and customer focus in terms of customer proximity are seen here the crucial elements of the business model, it should be noted that other key elements, for example, the profit or revenue model, may have significant implications for the developed framework and its relationships. Such insights can contribute to further elaboration of the theoretical bridges among the resource-based view, the business model,

and network approaches (Hoffmann, 2007). Similarly, the mediating effect of network governance in business model-performance relationship should be further examined and validated by additional empirical analysis. Finally, the PLS method utilized in the current study is useful especially when the theoretical ground for the phenomena is not firmly established. Hence, future research might benefit of analysis the network governance issue with other structural equation modeling techniques that enable a more robust confirmatory hypothesis testing.

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