S.R. KOENDJBIHARIE

The Information-Based View on Business Network Performance

Revealing the Performance of Interorganizational Networks

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Het op informatie-gebaseerde perspectief op de prestatie van bedrijfsnetwerken

THESIS

to obtain the degree of Doctor from the

Erasmus University Rotterdam

by command of the

rector magnificus

Prof.dr. H.A.P. Pols

and in accordance with the decision of the Doctorate Board.

The public defense shall be held on

Thursday September 4, 2014 at 13:30 hours

by

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born in The Hague, the Netherlands

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Erasmus Research Institute of Management – ERIM
The joint research institute of the Rotterdam School of Management (RSM)
and the Erasmus School of Economics (ESE) at the Erasmus University Rotterdam
Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM PhD Series in Research in Management, 315
ERIM reference number: EPS-2014-315-LIS
ISBN/EAN 978-90-5892-370-7

Cover: B&T Ontwerp en advies www.b-en-t.nl and Sarita Roshni Koendjbiharie
Design: B&T Ontwerp en advies www.b-en-t.nl

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The ink used is produced from renewable resources and alcohol free fountain solution.
Certifications for the paper and the printing production process: Recycle, EU Flower, FSC, ISO14001.
More info: http://www.haveka.nl/greening

To my network

Acknowledgements

This is the place where soon-to-be PhDs look back on their experiences. It is usually rife with clever metaphors and sentimentality. So you are forewarned...

Getting a PhD is like going on a road trip by car. The destination is clear but the journey there is not. In fact, the roads and terrains change frequently. Prof. Peter Vervest was the co-reader of my master thesis and after the defense he encouraged me to pursue a PhD. I am indebted to him for inspiring me and opening (car) doors. Throughout the journey, Peter's habit of thinking in an expansive manner often felt like he wanted the car to venture into space. While I never quite saw my car as a spaceship, this "thinking big" did provide me with novel perspectives on the journey. During the last stage Peter showed me how he can get down to the nitty gritty too, in terms of feedback, which I also appreciated.

Prof. Eric van Heck watched my journey more closely as on-site promoter. Eric's support is thankfully appreciated as well as his thoughts and critical questions to help further the work. Eric tests his PhD students and when he hears convincing arguments he will gladly give the green light to continue. I highly commend him for that. Moreover, Eric dedicated more time in his schedule to pick up the speed during the last leg of my trip. I have been glad to see him around the department and to always be able to discuss matters with him.

As my daily supervisor I was fortunate to have dr. Otto Koppius who also has a keen interest in networks. He is a role model scholar and to add, an incredibly widely interested and very sociable person. Otto jumped into my car from time to time to help me maintain a steady course, to point towards gas stations and to remove any real or perceived roadblocks on the way. An attestment of his qualities as a supervisor and there are many, is that at no point did he ever take over the steering wheel. He enabled my own journey and I am very thankful for all his encouragement and helpful supervision along the way.

For a while, it was difficult to navigate with this team of three strongly opinionated people offering different perspectives. However, when I learned how to make this network perform, it turned out to be a smooth ride at last. Over the years I have enjoyed working with each of them in courses, projects and boards and learned so much from them through all the interactions.

When cars break down you can count on the road assistance of Route Mobiel. I want to gratefully acknowledge the support of its Commercial Director Edward Reinderts who granted access to their network and data for the case study. For this field work I worked together with Maurice Koetsier whom I want to thank for transcribing interviews and for our discussions. We drove many kms around the Netherlands and enjoyed studying this business network in detail. For all his support with the Business Networking Game I want to kindly thank Ido de Lepper.

A newbie can learn a lot from looking at seasoned drivers. I want to thank and acknowledge the late prof. Keith G. Provan for his kindness, inspiration and pioneering works on interorganizational networks. Prof. Michael Jensen as well, for his inspirational teaching of social network theory. Their constructive feedback came at a pivotal point in my journey. Furthermore, I thank professors Jan van den Ende, Pursey Heugens, Patrick Kenis and professors M. Lynne Markus and Michael Jensen. It is a great pleasure to have you partake in respectively the small and large committee.

Parallel to the PhD journey I also gladly worked with dr. Marcel van Oosterhout and Marlies van der Meulen in a university – business collaboration. This showed me that project management where you bridge academia and practice is a skill in and of itself. What I learned through working in projects with managers and students, I apply today.

No road trip without company. I have so many fond and fun (PhD dinner) memories and I have spanned many links that will far outlast contracts and job assignments. I want to first thank my one and only PhD peer Annie (ShengYun) Yang for her continued support, positivity and the discussions about (PhD) life. Yang Song for being a great companion during Sunbelt and our travels. Marloes Stapel for our drinks. Then there is long list of other smart and fun(ny) people to thank: Luuk, Xiao, Paul, Nick, Wouter, fili Konstantina, filos Panagiotis, Clint, Irina, Gabor, Muhammad, Dirk, Ting, Yixin, Meditya, Marleen, Mark and all the other PhD students and colleagues (old & new) in the department. The cohesiveness and positive atmosphere should be credited to former chairs prof. Jo van Nunen en prof. Peter van Baalen who treated PhD students as equals within the department. I would like to kindly thank them for this type of leadership which benefited all. I also to want thank Ingrid Waaijer and Cheryl Eiting for being the heart of the department. What a joy for us to have you ladies at the office! I want to thank Mw. Bigler for developing my voice and being a lasting inspiration.

Finally, I would like to thank and acknowledge my family for their warmth, love and support in this journey of endurance. To my mom, for exemplifying strength, generosity and dedication and dad for having a rock solid belief in me. I have been given a wonderful childhood in which every single writing, drawing and story has been welcomed. To Soraya, I am so proud to be your older sister and of the experiences we share, keep on shining that million euro smile! To Sabrina whom I observed and learned from since the very beginning and to Jeroen who is my first brother. To Dani, your first writings are on my mantle piece and I look forward to more of your work and to Expert for his support.

Cheryl and Luuk I am glad to have to you as my paranimfs. 2014 is a big year for all of us.

To conclude,
I have reached my destination. I have pulled up outside of Leiden University.
This journey is done. A new one has begun…and I am raring to go.

Sarita

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CHAPTER 1 Introduction

1.1 Why Study Business Network Performance?

In the last thirty years, global developments including advancements in information and communication technologies (ICT) and process and product modularization have made the network form of organization more widespread than ever before.

In many industries large vertically integrated organizations have been supplanted by flexible networks of individual organizations connected by ICT (Hagel and Brown, 2005). These constellations of firms have been coined with terms such as “dynamic business networks” (Miles and Snow, 1986), “modular production networks” (Sturgeon, 2002) and “smart business networks” (Van Heck and Vervest, 2007). The terms describe networks where firms possess capabilities to quickly connect with and disconnect from other firms in the network in order to meet demand (Koppius and Van der Laak, 2009). Within such networks, multiple firms have to coordinate and combine efforts to deliver to end customers, products and services such as computers, flights, clothing and cars. Apple, Dell, RyanAir, Nike and Toyota are a few of the many examples of firms that operate as business networks. We shall highlight two cases from the clothing and telecom services industry: Li & Fung and Bharti Airtel.

Sourcing company Li & Fung serves private apparel firms by designing and managing customized supply chains consisting of specialized firms. These firms are temporarily linked for the fulfillment of a specific order. The company draws from its global sourcing network of 10,000 suppliers in 40 countries for this and oversees geographically dispersed manufacturing processes (weaving, dyeing, assembly etc.). Without owning factories itself, Li & Fung coordinates all stages of production through a business network of independent firms such as factories, garment makers and logistics providers to create a collective deliverable (Magretta, 1998; Bitran et al., 2007; Fung et al., 2008). The business network phenomenon is not restricted to products. Rather than staying vertically integrated as other cellular carriers, mobile operator Bharti Airtel outsources, what seems to be core activities namely its cellular network and IT operations. Network equipment vendors such as Ericsson, Nokia and Siemens provide equipment, installation and maintenance services

and IBM manages the IT infrastructure including intranet, billing and customer account management. Bharti Airtel itself focuses on the customer interface, branding, pricing and product innovation. As such, India's largest telecom provider neither manages its network nor runs its own IT systems. Bharti Airtel leverages its own competencies and those of specialized network partners to provide mobile services to 30 million subscribers (Gulati, 2010; Prahalad and Mashelkar, 2010).

These cases denote the transformation of organizations into networks while in other industries and sectors such as construction, public management and health care, networks continue to exist as traditional forms of organization (Luke et al., 1998; Sydow and Windeler, 1998; Provan and Milward, 2001).

This business network phenomenon shifts the attention of business and academia to processes and outcomes at the network level instead of at the firm or dyadic level. Research in this area is strongly needed for three reasons. *First* of all, coordination between firms to deliver products and services implies interdependence. Outcomes are not just the performance of any specific firm on its own but rather the performance of *entire networks* of firms. Therefore competition occurs among networks and not simply among companies (Dyer, 1994 p. 178; Fung et al., 2008 p. 43). Firms need to be able to compare performance with alternative forms of organization and with competing networks to adjust or to consider membership of a different network (Sydow and Milward, 2003). Focusing on only the own firm will not suffice here, considering firms and connections beyond organizational boundaries becomes critical for managers and also scholars. Hence, managers should focus on developing strategy not just for their own company but for their entire production network (Majumder and Srinivasan, 2008 p. 1189). *Second*, given this need, questions rise of how to define network performance and which concepts and indicators to use for evaluation. For organizational performance we have reached a degree of agreement on basic terminology and definitions. While it still remains a complex, broad and debated concept we have a grasp of organizational performance through overviews of the possible categorizations, concepts, operationalizations and stakeholders related to these, in for example the works of Venkatraman and Ramanujam (1986), Lebas (1995) and Richard et al. (2009). For the domain of business network performance this is not the case.

Previous research on supply chains and networks in public management do offer various concepts and measures for network performance. However, a comprehensive conceptualization is still lacking and therefore at this time the understanding of this concept and its meaning is rudimentary. Theorizing and operationalizing beyond traditional performance concepts and metrics can help here. Additionally, how networks are possibly already being evaluated and managed in practice could infuse the development of theory, concepts and techniques and vice versa (Sydow and Milward, 2003). *Third*, even with an in-depth understanding of the concept of network performance, questions remain on how to influence it. Network performance is not necessarily the same as individual firm performance, what is beneficial for single firms could be detrimental for the whole network (Provan et al., 2007, p. 509) or vice versa.

This has for example, been exhibited in problems of collective action such as the tragedy of the commons (e.g. Hardin, 1968) and in a business context, the bullwhip effect found in supply chains. The tragedy of the commons occurs when a common resource is depleted by individuals who each have an incentive to act against the long term interests of the collective. In Hardin's example (1968) a pasture shared by herders is ultimately overgrazed because each individual herder receives all the benefits of letting an additional cow graze while they share the cost of the over-exploited pasture. The bullwhip effect describes large inefficiencies and loss for the whole supply chain as a result of optimizing behaviors by each individual member in the chain in making inventory and production decisions. Without information sharing and coordination across supply chain members, the distortion of demand information passed through orders along the chain, propagates upstream in an amplified form with detrimental impacts including excess inventory, capacity and warehousing, lost revenues and overtime (Forrester, 1961; Lee et al., 1997).

These examples show that actions of individuals aligned with self-interest can run counter to the actions aligned with the interests of the collective. As such, optimizing performance on the actor level can conflict with performance on the network level. Or simply put, local gain can lead to global pain. The theoretical knowledge on firm level performance may not bear relevance on the network level. As with collective action and the bullwhip effect, different decision making and action may be required of firms for improving network

performance than would be the case for individual firm performance. Thus, extrapolating theoretical mechanisms explaining firm performance to network level may not necessarily be appropriate. To conclude, these reasons strongly point to the need for theory development on the performance of interfirm networks.

This dissertation fulfills this need through the combined findings of conceptualization research, laboratory experiment studies and a field case study.

1.2 Research Objectives and Questions

In this dissertation we aim to reach a theoretical and practical understanding of business network performance. There are three research objectives here. As we will see, as an area of research, network performance is characterized by both dearth and diversity. Relatively few studies on network level performance have been carried out and those that have been conducted apply different definitions, concepts and measures. Authors used various concepts for evaluation and the studies identified diverse drivers. This fragmented development in the literature makes it difficult to interpret results and build on findings. Thorough and comprehensive academic inquiry into these different conceptualizations, operationalizations and factors has not taken place to this date and as a consequence, network performance while becoming a topic of interest, is not well understood.

The first objective in this dissertation is to provide conceptual clarity on network performance by analyzing the extant literature to develop and define the concept. The second objective is to validate this conceptualization by applying it in an empirical setting and assessing its relevance. The third objective is to conduct theorizing based on the findings from prior network performance research and the empirical studies in this dissertation resulting in an integrative conceptual framework. Meeting these goals would improve knowledge on the concept of network performance, foster communication between and among the academic and business community and facilitate further research in this domain.

To reach these goals, we are guided by the following research questions:

RQ1: How can business network performance be conceptualized, validated and measured?

RQ2 What are the main factors that explain business network performance?

Part of the first research question deals with conceptualization. This is a process in scientific inquiry where concepts are developed and clarified in order to arrive at a precise definition of the phenomenon under study. We conduct conceptualization research by analyzing existing network performance studies from different management disciplines and the concepts used in these studies. Based on the analysis we conceptualize network performance through three different lenses: *the firm lens*, *customer lens* and *systems lens*. We also validate these lenses by applying the lenses in a field case study.

The second research question is answered by developing and examining a theoretical framework of network performance throughout the chapters in this dissertation. First, we analyze the extant literature on network performance further to identify categories of factors and their relations in order to build a preliminary theoretical framework. Network structural characteristics, network processes and network contextual characteristics are categories of factors that emerge as building blocks for explaining network performance. Furthermore, in this process we introduce and connect the category of network information architecture to the framework. Network information architecture is defined as *the overall level of actor, dyadic and network information that is available to and relevant for the decision making processes and actions of organizations in a business network.*

After developing this preliminary framework, we will examine and elaborate on it through empirical studies (i.e. laboratory experiments and a case study). There we will focus on different parts of the framework with the aim to expand the categories of the framework and validate its mechanisms. We will focus on the different lenses developed in the conceptual part of the dissertation. First, we adopt the customer lens in a controlled laboratory setting. Here we shall examine the effects of network information architecture on network performance through network structural characteristics and network processes. Second, all three lenses are adopted in a case study, to add to the categories of network

structural characteristics and network processes by exploring network performance in the field. Here we find that institutional logics emerge as an important factor explaining network performance through network processes. Finally, we arrive at a theoretical framework of network performance which integrates all the findings in this dissertation.

1.3 Research Design

Table 1.1 displays the methods and chapters related to the research questions raised in the previous section. The methods and approaches in this dissertation are detailed separately in Chapters 2, 3 and 4. Here we provide an overview and the justification for these methods. Our choice in research methods resembles that of multimethodology (Mingers, 2001). Multimethodology combines methods embodying different paradigms, that are developed specifically for the task, in our case conceptualizing and explaining network performance. Through analysis of the literature in Chapter 2 we conceptualize network performance via three different lenses and develop propositions that connect network information architecture to network performance via network structural characteristics and network processes. The empirical methods to validate several of these relationships are laboratory experiments (Chapter 3) and a case study (Chapter 4). Each of these allows us to further investigate the preliminary framework developed in Chapter 2.

Table 1.1 Research methods, questions and chapters

Method / *Question*	**Conceptualization study** **Chapter 2**	**Laboratory experiments** **Chapter 3**	**Case study** **Chapter 4**
RQ1. How can business network performance be conceptualized and measured?	✓		✓
RQ2. What are the main factors that explain business network performance?	✓	✓	✓

Triangulation is the use of multiple research methods to secure an in-depth understanding of the phenomenon in question (Denzin and Lincoln, 2011). The combination of multiple methodological practices, empirical materials and perspectives in a single study is best understood, as a strategy that adds rigor, breadth, complexity, richness and depth to any inquiry (Flick, 2002, p. 229).

Another advantage of multimethod approaches is complementarity. The strength of one method can compensate for the weakness of another method. Here for example, the internal validity of the laboratory experiments compared to that of the case study. Furthermore, integrating qualitative and quantitative approaches and drawing overarching insights, leads to deeper and richer inquiry than when relying on a single method. The multimethod approach in this dissertation allows for emerging insights (as with the case study) which is particularly relevant for generating knowledge on this understudied topic. A conceptualization study and a series of laboratory experiments followed by a case study, as done here, will provide converging lines of evidence and corroboration as well as separate contributions such as concepts and propositions for future research. Next we justify the selection of each of these research methods.

Why a Conceptualization Study

The conceptualization study conducted in Chapter 2 is necessary for two reasons. First, the development in the literature is fragmented, studies are not really building on each other but are rather scattered efforts. In fact, different concepts have been used (e.g. financial performance, customer satisfaction, robustness) and different drivers have been identified (e.g. information sharing, trust, network governance). So there is a pressing need to coalesce these studies on the same phenomenon in terms of concepts and factors. Second, the extant literature seldom defines the chosen concept or motivates why this concept has been chosen for performance evaluation. These reasons indicate that merely organizing the extant literature is not sufficient here, the much needed extra step is to develop the concept of network performance. Authors of conceptualization studies analyze and synthesize the extant literature in order to distinguish and define the fundamental dimensions of the

concept of interest and their underlying assumptions and often also discuss operationalizations per dimension. Their aim is to disambiguate conclusions from prior research and to promote consistency and precision in future use of the concept and its measures. For instance, Harrison and Klein (2007) disentangle diversity into three distinct types namely: separation, variety and disparity. This study elaborates on several research implications as a result of key differences between the types in terms of meaning, foundational theories and distribution shape at maximum diversity. One of the methodological implications that is demonstrated by the authors is how misalignment between conceptualization and operationalization in these types of diversity produces misleading results. Another example is McCarthy et al. (2010) that break down the concept of environmental velocity into the rate (low to high) and direction of change (continuous to discontinuous) for the primary dimensions of the organizational environment namely, technological, product, demand, regulatory and competitive. This conceptualization leads to a typology of velocity patterns which can be used to understand and direct organizational and strategic processes and outcome, without overlooking the multiple and distinct velocity dimensions. Conceptualization studies encompass more than literature reviews in terms of the analysis and discussion. The need for further concept development of network performance is why we chose a conceptualization study as the method in Chapter 2. Our conceptualization of three lenses (firm, customer and systems) ultimately leads to the explanation of network performance in a preliminary theoretical framework. In Chapters 3 and 4 we will examine this framework further with laboratory experiments and a case study.

Why Laboratory Experiments

The difficulties of empirical network level (performance) research are covered in the Chapter 3 (e.g. costly, labor intensive, risky). Laboratory experiments mitigate these problems to a large extent, especially compared to other methods such as surveys and field studies. With an experimental design one can study a relation over time in many different networks. This would be difficult to achieve in a field setting. With a concept such as network information architecture it is very hard to track it in the field, due to issues of

recall error, completeness and accuracy of the data. With laboratory experiments however, the setting is under the control of the researcher. The experiments that we have run are supported by software that is designed to allow full access to all relevant network data. Experiments run with software have been conducted before for research on business and social networks (e.g. Van Liere et al., 2008; Kearns, 2009). In fact, the term "network experiments" is increasingly being used to describe series of experiments where human subjects represent vertices with edges and the manipulations are intended to examine the effects of the network structures imposed on them on their behavior and characteristics and vice versa and the effects of network structure on individual and collective outcomes (Falk and Kosfeld, 2003; Berninghaus et al., 2006). A criticism against laboratory experiments is the use of a simplified model which comes at the expense of realism and by implication, generalizability. However, a simplified model is warranted as long as it captures those elements that are essential to the real world context of the phenomenon under study (Zelditch and Hopkins, 1961; Weick, 1965). The design of the experiments detailed in Chapter 3 includes essential characteristics to business networks. To conclude, the advantages of such laboratory experiments is why we used this method in Chapter 3.

Why a Case Study

A case study was conducted in this dissertation for two reasons. First, instead of conceptualizing network performance and stopping there, we wanted to demonstrate its usefulness by applying the three different lenses and presenting concrete examples in the field. Conceptualization and operationalization in a real life case increases the understanding of the phenomenon since it ensures a tight connection between conceptual constructs and measurable variables (Siggelkow, 2007). Providing measures can also help researchers to imagine how they would study network performance in other cases. Second, the preliminary framework developed in Chapter 2 needs to be validated and expanded. Case studies are a "source of well grounded, rich descriptions and explanations of processes occurring in local contexts" (Miles and Huberman, 1994, p. 15). This makes them well suited for building emergent theory (Eisenhardt and Graebner, 2007) which is our purpose when explaining network performance. Moreover, illustrating the conceptual

arguments by means of empirical data increases their persuasion because it shows how these theoretical arguments operate in the field (Siggelkow, 2007). That is why we selected a case study as our method in Chapter 4.

1.4 Scientific Relevance

This dissertation makes the following scientific contributions. First, it advances knowledge on interorganizational networks and performance by providing three lenses from which to evaluate network performance. Second, we bring an information-based view into the literature on interfirm networks. Information based models have not come to the forefront of network theory yet, certainly not on network level. Moldoveanu et al. (2003a), Van Liere (2007) and Moldoveanu and Baum (2011) are notable exceptions. In their plea for more research at this level, Provan et al. (2007) highlight network structure, governance and outcomes as future areas of interorganizational network research. This dissertation answers their call by researching network outcomes in depth and showing how prevailing institutional logics and the network information architecture impact outcomes via the structure and processes of the network. The dissertation contributes to institutional theory by studying institutional logics within interorganizational networks. Thornton and Ocasio (2008) discussed this as a potential level of analysis for further theoretical development on institutional logics. Owen-Smith and Powell (2008) point out the fruitfulness of combining research on institutions and networks which have mainly advanced separately. “Networks and institutions set the conditions of possibility for each other” (ibid. p. 618). These authors assert that the processes and structuring of networks can only be understood by taking into account institutions and their influence through prevailing institutional logics. The findings in our case study support this claim. Institutional logics have been studied for networks of organizations and individuals (Bhappu, 2000; Blatter, 2003; Shipilov et al., 2010). The focus in these studies is on the implications for governance structures and management practices. To the author’s knowledge, institutional logics have never been connected to the consequences for performance of interorganizational networks. In this work we demonstrate the existence and relevance of institutional logics to network structural characteristics, network processes and ultimately network performance in the

road assistance industry. This is a new empirical context in addition to accounting (Thornton et al., 2005), architecture (Thornton et al., 2005), banking (Marquis and Lounsbury, 2007), healthcare (Scott et al., 2000; Reay and Hinings, 2005), higher education publishing (Thornton, 2002), orchestras (Glyn and Lounsbury, 2005) among others where tensions between institutional logics have already been studied. Moreover, we connect institutional logics to the information management discipline by showing how distinct institutional logics impact information sharing differently and thereby the information architecture of a business network. Section 5.2 recaps and elaborates on the theoretical contributions of this dissertation.

1.5 Managerial Relevance

Besides filling a gap in the literature on interorganizational networks, this dissertation will also provide insights for business practice. Järvensivu and Möller (2009) observe that as with managing organizations, managing networks also requires planning, organizing, leading and controlling. The difference is however, that network management is conditioned by continuous interaction and adaptation among autonomous actors. Ritter et al. (2004) hold that network management is a continuous process by all firms in the network and that network structure and network performance is coproduced by their actions. Network management deals with mobilizing and coordinating a group of autonomous but interdependent actors and the complexities in optimizing network level performance (Möller and Svahn, 2003). Interdependence implies that each organization has some degree of influence on other firms in the network (Ritter et al., 2004) and through this, an influence on network performance. However, the ability of an organization or manager to have influence on network performance will depend on the role and position of the organization in question. The insights from the dissertation will in particular be more actionable for lead organizations that exercise considerable power over networks (Jarillo, 1988). Compared to interorganizational relations and supply chains, the knowledge on network management and performance still needs to accumulate. Section 5.3 discusses the managerial contributions and implications of this dissertation.

1.6 Reading Outline

The outline of this dissertation is as follows: Chapter 2, 3 and 4 address the research questions raised in section 1.2 by means of conceptual, case and laboratory experiment studies. Chapter 2 deals with the unified conceptualization of network performance and the identification of factors through analysis of the present literature.

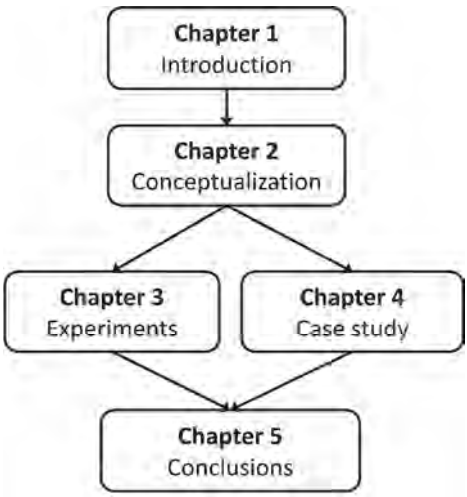


Figure 1.1 Structure of the dissertation

Chapters 3 and 4 are original works that also deal with the explanation of network performance. However, Chapter 3 emphasizes network information architecture while Chapter 4 strongly focuses on institutional logics within the business network. Moreover, Chapter 3 exclusively focuses on network performance from the customer lens while in Chapter 4 all three lenses on network performance are adopted. Chapters 3 and 4 are placed on the same level in the outline because of their separate contributions and insights which will be combined in the subsequent chapter. Chapter 5 brings together the findings from the studies in Chapters 2 to 4. This chapter presents the conclusions in this dissertation, the implications for academia and practice, limitations of the studies and finally the recommendations for future research.

CHAPTER 2 Conceptualization

2.1 Introduction

The objective here is to reach a coherent understanding of the meaning of network performance and to synthesize the existing explanatory network performance studies. To this end, we first briefly discuss the literature on performance in business or interorganizational networks[1] (hereafter used interchangeably). Discussing performance on different levels of analysis will show the advances that have been made and the caveats that remain. Then we analyze the relatively scarce and diverse literature on network level performance. Through this analysis which organizes and unites present contributions, network performance will be theoretically clarified and defined. Then we focus on explaining network performance, the analysis leads to categories of factors that drive network performance including a new concept, network information architecture. Through these steps covering theoretical mechanisms, a preliminary integrated framework is built.

2.2 Research Background: Differentiating between Networks

Before analyzing the existing network performance studies, we will first define business networks and performance. *Network* is a term used in management research for an impressive variety of connected entities which include words, computers, mobile phones, countries, persons, business units and organizations. All these studies, whether published or presented at management, or the more recently spawned networks or network science conferences, are "network" studies. The term is also widely applied in business. Journalists, managers and consultants speak of social or business networking, the network society, the network economy or a networked world. Given this ubiquity it may well be the most popular term in both worlds of business and academia today. This ubiquity is related to the open nature of the concept, any kind of business structure can be called a network (Blankenburg and Johanson, 1992 p. 5). A while ago, Nohria (1992 p.3) commented that indiscriminate application of the term in literature could come at the cost of precision. It

[1] In this dissertation we will use the terms interorganizational and business network interchangeably. Interfirm network is used to describe an interorganizational network consisting of for-profit firms.

could render "network" a metaphor instead of a well-understood concept. For our field of interest *interorganizational networks*, we will next argue that what would go a long way in alleviating the loss of precision is: selective use of the term and specification of the network under study, the set of actors, ties, interdependencies and any potential network objective from the outset of readings.

Within the literature on interorganizational networks, scholars use the term "network" for a plurality of forms[2] which include *research groups* and *consortia* (Aldrich et al., 1998; Huggins, 2000; Provan et al., 2013), *bank syndicates* (Baum et al., 2003), *interlocking directorates* (Mizruchi and Bunting, 1981; Haunschild and Beckman, 1998), *franchises* (Nault and Dexter, 1994; Chaudey and Fadairo, 2008), *production* or *supplier/ supply networks* (Saxenian, 1991; Dyer, 1996a; Choi and Kim, 2008), *business groups* (Luo and Chung, 2005; Mahmood et al., 2012), *alliance networks* and *constellations* (Gomes-Casseres, 1996; Das and Teng, 2002; Goerzen and Beamish, 2005), *industry level alliance networks* (Gulati, 1995; Koka and Prescott, 2002; Schilling and Phelps, 2007), *industrial districts* and *clusters* (Inzerilli, 1990; Saxenian, 2006; Ferrary and Granovetter, 2009) and *business ecosystems* (Moore, 1996; Iansiti and Levien, 2004a).

In this body of literature the full terms *business network* or *interorganizational network* or *interfirm network* are being applied. The suggestion made here is to continue to use these terms for networks with *organization-to-organization ties* and where the organizations in question are *autonomous* i.e. the relations between the organizations are non-hierarchical and there is substantial operating autonomy (Provan et al., 2007 p. 482). The only criterion should be a focus on how organizations that are independent relate to other independent organizations. If these interorganizational ties are accompanied or impacted by interpersonal ties such as in the literature streams on social capital and embeddedness building on the seminal works of Granovetter (1985) and Burt (1992), for example Uzzi (1997), Maurer and Ebers, (2006) and Tsaur and Wang (2011), then these networks still fall within the category. Interlocking directorates can also be seen as an interorganizational network. Although the actors here are individuals, the presence of these directors on

[2] Here we add to the list of networks by Moldoveanu et al. 2003a (p. 223) and cite studies that focused on these types of networks.

boards connects organizations to each other. However, if the study focuses exclusively on ties between individuals (e.g. managers) then the terms *corporate*, *social* or *informal networks* are appropriate. Exclusive use of the aforementioned terms for interorganizational phenomena is important because it is a distinct level of analysis. Research findings on other levels of analysis for instance interpersonal and interunit networks may at times be fruitfully extrapolated to interorganizational networks and vice versa. However, distinct mechanisms will remain because the networks contain different kinds of actors and behavior (Brass et al., 2004). For instance, while the interconnection between the two levels is recognized, authors distinguish between individual social capital (seen as a private good) and organizational social capital (seen as a public good[3]) (Kostova and Roth, 2003; Inkpen and Tsang, 2005). Moreover, Zaheer et al. (1998) studied both interorganizational and interpersonal trust and found differences in the consequences for exchange processes and outcomes in dyads. Interorganizational trust had direct effects on negotiation costs, level of conflict and relationship performance while interpersonal trust only had influence on negotiation costs but in the opposite direction than was hypothesized. Furthermore, the difference between an interorganizational network and vertically integrated organizations is the independence of participating organizations in a network (Park, 1996). When organizations are not autonomous meaning that their managers cannot make their own decisions (i.e. choose their counterparts, allocate resources, run their operations), similar phenomena can be expected as in the case of vertically integrated organizations. In those cases the terms *network organization* or *intraorganizational*, *proprietary* or *internal network* apply because of the hierarchical nature of the relations. Such as with networks that involve subsidiaries and a parent company that oversees the administration of the network, also called multinational corporations (Ghoshal and Bartlett, 1990) or transnational networks. There the operational autonomy of the organizations will be restricted to a large extent because there are authority relationships (Provan et al., 2007) and this changes dynamics in the business network as a whole.

[3] Public means that social capital is seen as a collective asset that all members of an organization can tap into even if they were not involved in the creation of the social relationships from which these resources were derived (Kostova and Roth, 2003 p. 301)

The above discussion covers the selective use of the term, what remains is defining the network by specifying the set of actors, ties, interdependencies and any potential network objective. Defining these points would help distinguish between and compare among the plurality of types mentioned before. Previous work classified interorganizational networks and distinguished interorganizational networks based on several dimensions and properties. We chose to combine existing typologies of Inkpen and Tsang (2005) and Raab and Kenis (2009) in order to make the most relevant distinctions between common types of interorganizational networks.

The first dimension is interdependence. Vertical - horizontal interdependence is widely known for describing relations between organizations. The former is a situation where there is (serial) interdependence of complementary organizations while the latter deals with parallel interdependence among organizations that are (potential) competitors (Park, 1996). This dimension refers to the differences in positions that organizations occupy along the network's value chain (Inkpen and Tsang, 2005). However, as the scope of a network expands, both horizontal and vertical interdependence exist in the network as well as other types of interdependence such as for business ecosystems. That is why four categories were created for this dimension (see Table 2.1).

The second dimension of consciously created - emergent is described by Raab and Kenis (2009) for characterizing the network as a whole. The former are goal directed networks in which organizations are aware of each other and act collectively, while the latter are serendipitous networks that are emergent from the interactions between individual organizations which act separately. To this Inkpen and Tsang's (2005) insights are added that it covers the extent to which: the network governance is structured, members' roles and relationships are clearly defined and members are organized to achieve certain goals. Consciously created networks tend to develop systematically while emergent networks tend to develop organically. With consciously created networks there is generally a network objective. These interorganizational networks (e.g. consortia, trade associations, franchises) are likely to be formalized to a large degree in exchange and contractual agreements, which protects the organizations' reciprocal rights (Grandori and Soda, 1995). Combining the two dimensions lead to a typology of 6 business networks which is displayed in Table 2.1.

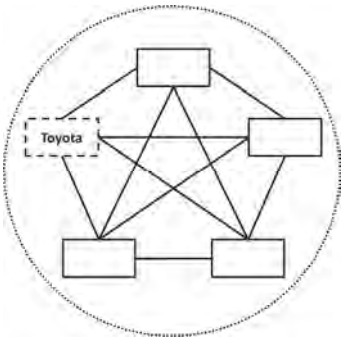
Type of network	**Consciously created**	**Emergent**
Horizontal	I	III
Vertical	II	IV
Horizontal Vertical	--	V
Horizontal Vertical and Other	--	VI

2.1 Typology of interorganizational networks

Two things should be noted here. First, networks that include more than just horizontal or vertical interdependence between organizations are typically not consciously created. Second, the plurality of network forms at the beginning of section 2.2 is not categorized here, this is because network forms do not always exclusively belong to one category. Restricting network forms to one category does not represent business reality and its wide spectrum of interorganizational networks (see also Inkpen and Tsang, 2005 Figure 1 on p. 148). It entirely depends on the design, scope and development of the network where it would fit in the typology.

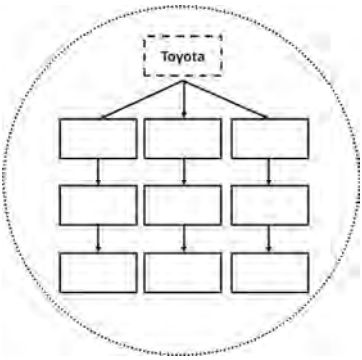
For instance, depending on their scope, trade associations can involve vertical interdependence but also horizontal interdependence or both. Strategic alliance networks can range from more emergent from the interactions between individual network members to being consciously created through their collective actions. Moreover networks can develop over time from emergent to consciously created and vice versa. That is why it is so important that authors detail the network in terms of its actors, ties, interdependences, the network objective, in order to identify which type of network is under study. Variations in these network properties lead to distinct types of networks with consequences for the operation of theoretical mechanisms. The following network instances involving Toyota are classified as Type I, II, V and VI and show their distinctions:

I) Alliance network: *consciously created - horizontal interdependence between members*



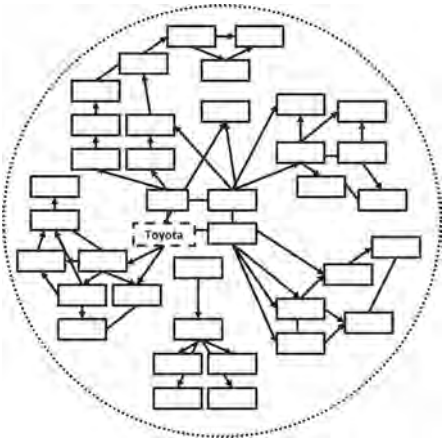
The collective objective is leveraging synergies among organizations performing similar functions. This is the Alliance of Automobile Manufacturers of 12 manufacturers including Toyota, Chrysler, Ford and General Motors for developing and implementing solutions regarding sustainable mobility, motor vehicle safety and other societal themes (Auto Alliance, June 2013).

II) Production network: *consciously created - vertical interdependence between buyers and suppliers*



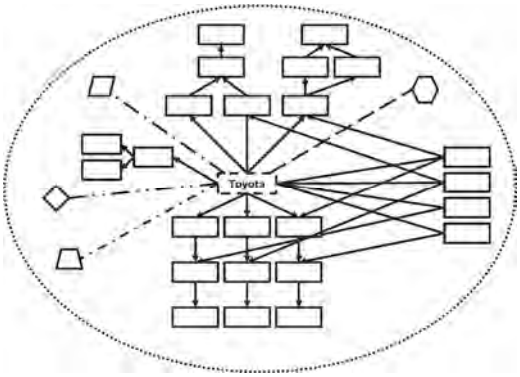
The collective objective is combining the efforts of differentiated firms. This is Toyota's network of first and second-tier suppliers and manufacturers for vehicle parts and systems, distributors/dealers that jointly produce and sell Toyota motor vehicles.

V) Industry level alliance network: *emergent - horizontal and/or vertical interdependence between industry participants and buyers and suppliers*



There is no collective objective, membership is based on industry classification and alliance activity. This is the global motor vehicles and vehicle equipment alliance network (Rosenkopf and Schilling, 2007) to which Toyota and all firms engaged in manufacturing or assembling passenger automobiles or their parts such as brakes, engine, mufflers, windshield wiper systems, belong (OSHA, June 2013).

VI) Business ecosystem: *emergent - horizontal, vertical and other interdependence between focal organization and buyers, suppliers, complementary product and service providers, competitors, technology providers, regulators, consumer associations, labor unions etc.*



There is no collective objective but rather for Toyota itself to monitor the health of each domain or part in the network that is critical to its own offerings (Iansiti and Levien, 2004b). This is Toyota's ecosystem consisting of the firms in its production network but also oil and gas companies and their suppliers, other car manufacturers that share the same suppliers as Toyota, software and cloud computing providers[4], government labor union, Automobile Protection Association and media (such as during the gas pedal recall issues (Kingston, February 2010).

As can be read these networks can and do overlap in terms of actors and structures. Production networks are a substructure of a business ecosystem. Production and alliance networks can be substructures of an industry level alliance network. Nonetheless, variations in the scope, ties, interdependence and objective can make these networks distinct from each other in nontrivial ways. Some network processes will be different across these types of networks, while others will be to some extent similar. This is due to the nature of interdependence[5] which influences the outcome of interorganizational ties and networks (Hennart, 1988; Teece, 1992; Park, 1996). Secondly, the presence or absence of a shared purpose among the organizations also differentiates the interorganizational networks through the behavior of these organizations.

[4] Toyota is setting up a social networking service called "Toyota Friend" with Salesforce.com and Microsoft so that drivers can interact with their cars in ways similar to Twitter and Facebook. The service will allow owners to exchange real time updates or "tweets" with other Toyota drivers, connect with local dealers and remotely obtain diagnostic information about their hybrid vehicles e.g. battery usage (Dawson, May 2011; Kageyama, May 2011).

[5] Interdependence is not limited to horizontal or vertical, there are other types such as lateral (e.g. Hovorka and Larsen, 2006). The point made here is to specify whatever type there is among the organizations in the network.

For example, Dyer and Nobeoka (2000) identified and described the knowledge sharing processes in the Toyota production network. They describe how network-level knowledge acquisition, storage and diffusion processes and also rules for knowledge protection and appropriation, form a strong network identity[6] with implications for the knowledge sharing processes themselves and for network performance (see Figure 2.1).

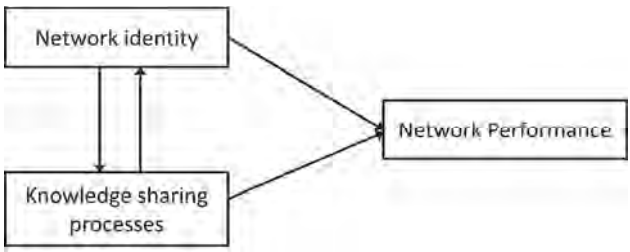


Figure 2.1 Conceptual model Dyer and Nobeoka (2000)

Let us now compare the theoretical mechanisms for the three other types of networks:

For the alliance network which is also consciously created and goal directed these mechanisms could work as well but up to a certain limit. Knowledge sharing would present more challenges since the network consists of directly competing manufacturers only. Therefore dilemmas of knowledge spillover and free riding are more difficult to solve through creating incentives and setting rules than in the production network. There Toyota made sure to separate directly competing suppliers in the learning teams (Dyer and Nobeoka, 2000 p. 362). In the case of horizontal interdependence, setting boundaries for organizations' contributions and access to other organizations' assets is more difficult and thus present a higher level of appropriability hazards for protecting firm-specific assets and of operational difficulties related coordinating the organizations' activities. Developing an identity would depend on the complementarity of the member organizations and the degree to which shared objectives overlap with the individual objectives of member organizations

[6] Network identity means that there is a sense of shared purpose with the collective, it is defined by the boundaries which dictate who is and who is not member of the network, by shared goals and values and by patterns of interaction among organizations that give rise to a common language and frameworks for action (MacDuffie and Helper, 1997; Dyer and Nobeoka, 2000 p. 352).

and their private incentives. As was mentioned before consciously created (I, II) as opposed to emergent networks (V, VI) have the ability to form a collective or network identity. For business ecosystems there is no shared purpose for the entire business ecosystem thus development of a collective identity would only possibly happen in parts of the ecosystem. Knowledge sharing in business ecosystems across various domains may not be so relevant or even possible since domains can be widely ranging and disconnected. Within a specific domain (e.g. car manufacturers) there are issues of knowledge sharing and direct competition again. For the industry alliance network, developing a network identity is near impossible because there is no shared objective because the firms belong to different production networks that compete with each other. Knowledge sharing would be relevant because it concerns organizations operating in the same industry.

The above makes clear that different types of network can present different conditions to organizations with implications for the processes and outcome in and of the networks. Therefore it is important in any research endeavor to precisely define the network under study on these distinguishing characteristics. We recommend authors to provide similar descriptions as presented above and to do this in the title, abstract and introduction of their studies before delving into the subject matter. By doing so, researchers can compare and differentiate between interorganizational networks and theoretical insights can accumulate. Examples of studies that describe the type network in detail from the outset of the article, are not so common. Therefore the next examples involve intraorganizational networks:

Keiretsu Networks in the Japanese Economy: A Dyad Analysis of Intercorporate Ties.
(Lincoln et al., 1992)

"We analyze the organization of keiretsu networks in the Japanese economy using data on the top 50 financial firms and 200 industrial corporations. Control relations between pairs of firms are modelled as a function of bilateral exchange relations and other firm- and dyad-level covariates in accordance with resource dependence and transaction cost theory. Firms with financial and commercial connections develop quasi-administrative ties through cross-shareholding and director transfers. Keiretsu networks have two sides: (1)

horizontal relationships of mutual support and defense among large, established firms as indicated by reciprocity of control and exchange, homophily among "big-six" affiliates, and symmetry in the effects of purchase/supply transactions on control; (2) vertical structures of asymmetric exchange and control between financial firms and industrial firms, large firms and small firms, and "big-six" firms versus independent companies" (definition of keiretsu provided on page 1).

Where can capabilities come from? Network ties and capability acquisition in business groups (Mahmood et al., 2011)

"In this study, we examine how firms' multiplex network ties in business groups represent one important source of capability acquisition. Our focus allows us to go beyond the traditional focus on network structure and offer a novel contingency model that specifies how different types of network ties (e.g., buyer-supplier, equity, and director) individually and in complementary combination, will differentially affect the process of R&D capability acquisition (definition of business group provided on page 1).

There are many other studies on interorganizational networks where the exact type of network studied can only be understood from reading well into the article, often up until the methods section. As was discussed before, even within a particular network form, there can be variations that need to be clear in order to compare studies and their insights. Therefore we suggest the following:

Guideline 1: *Theory building on interorganizational networks is enhanced by a precise definition of the network under study with specification of: the set of actors, the ties, the nature of the interdependence between organizations and the potential purpose of the network.*

Following the guideline ourselves we will spend time here describing the characteristics of the business networks under study in this work, namely production networks (Type II in the typology) and where relevant, cite literature that emphasized these features of interorganizational networks before.

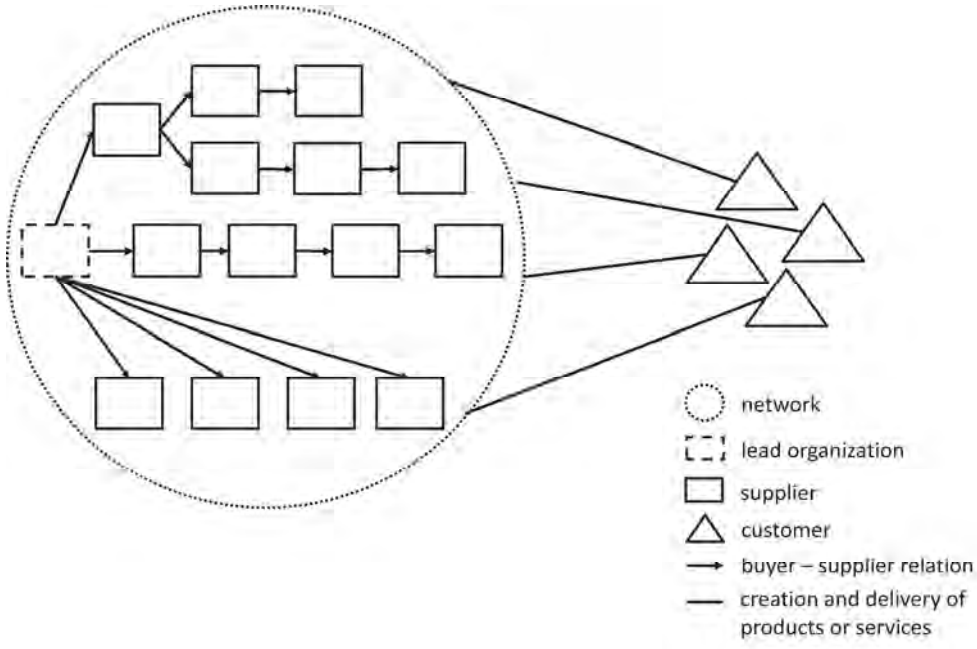


Figure 2.2 Stylized representation of a production network

Figure 2.2 provides a basic representation of a production network. The dashed line box is the lead organization, this could be Apple and the triangles could be iPhone customers. The lead organization usually designs the network and manages the customer relationship. The other firms are then cellular carriers, assemblers, electronic-component manufacturers of touch screens, LCD panels and memory chips among others. The lines between the network and customers indicate the creation and delivery of products and services. The arrows represent buyer and supplier ties. These are stylized representations. The structures shown can be longer or shorter in practice. Moreover multiple structures are included to show the possibilities. We can see three different structures of buyer – supplier ties: upper

(one firm, two chained), middle (one firm, triple forked) and lower (four forked). The upper structure could be the Toyota network with first, second, third and fourth tier suppliers. The middle one represents networks as seen in the road assistance case study in Chapter 4. The lower structure resembles the structure of the networks of the firms mentioned in section 1.1 (Apple, Li & Fung, Bharti Airtel, etc.). Different structures are also possible. Some lead organizations even use different structures within the same network depending on the order or specific customers. Altogether, these structures that are formed to deliver a product or service to customers, constitute the business network (delineated by the dotted line). Hence, the network is bound based on the product or service. We do not limit the focus to any particular type of production network in terms of structure but there are other basic characteristics that will be specified next.

The specification for the business networks that we study can be summarized as follows:

- Consciously created (Sydow and Windeler, 2003; Inkpen and Tsang, 2005; Raab and Kenis, 2009) and goal directed (Kilduff and Tsai, 2003)
- Joint production function (Provan and Milward, 2001) of products and/or services
- Differentiated and complementary organizations
  (Miles and Snow, 1986; Anderson et al., 1994)
- Interdependent yet autonomous organizations (Raab and Kenis, 2009)
- Multisourcing (Miles and Snow, 1992; Harland, 1996; Fung et al., 2008)

We shall focus on networks that are consciously created. As described previously these networks are not serendipitous or emergent from all separate relations between individual organizations but designed and goal directed (Kilduff and Tsai, 2003 p. 88-89; Raab and Kenis, 2009 p. 199). The management and design is usually done by the organization that handles the customer relationship, but other firms can also carry this responsibility. In these networks relationships are organized and managed as part of a larger complex whole (Sydow and Windeler, 2003). To a large extent, both network governance is structured and members' roles and relationships clearly defined (Inkpen and Tsang, 2005). The organizations in these networks have a collective goal because the network has a joint

production function (Provan and Milward, 2001) which is the delivery of a product or a service. The networks consist of differentiated organizations that coordinate to that end (Anderson et al., 1994). The organizations are connected by ties that usually involve transactions, resource and information exchange. The organizations are complementary which means that none of them would be able to produce the network output on their own (Miles and Snow, 1986 p. 65).

The networks consist of organizations that are interdependent yet autonomous (Raab and Kenis, 2009, p.198). Autonomous means here that the organizations are legally separate and that the management of these firms each can make their own decisions. The networks are multisourcing or broad (Harland, 1996; Fung et al., 2008) as opposed to single sourcing or narrow. It means that along the stages in the value chain there is a pool of network partners that can be chosen from to form a chain rather than a highly stable network of suppliers that dedicate their assets to a single focal firm (Miles and Snow, 1992). Here we consider a network as multisourcing if at least at one of the stages more than two partners are relied on frequently to meet demand[7].

Based on the above we define business networks in this dissertation as:

Definition 1: business networks *are consciously created, goal directed, multi-sourcing networks consisting of three or more differentiated, complementary, interdependent but autonomous organizations that coordinate for the joint production of products and/or services.*

The definition of business network performance will be provided after section 2.6.3. In this dissertation the focus will be on final performance outcomes as opposed to intermediate outcomes or processes. For example productivity, efficiency, survival rather than learning, opportunism, knowledge sharing. Next we will briefly review literature that has made advances on performance within interorganizational networks.

[7] Frequently is a relative term, we mean that there are alternatives for network partners and they are used for production regularly instead of sporadically. Roughly speaking, it could be that each network member is involved in at least 10% of the total orders by the network on a yearly basis.

2.3 Advances in the Performance *in* Business Networks

Research on performance in interorganizational networks has been conducted on four different levels of analysis: actor (the individual organization)/egonetwork[8] (all nodes directly connected to one particular organization), dyad (pairs of organizations), chain (sets of organizations in a linear chain configuration) and whole network (the whole set of organizations involved in the production and delivery of a particular product or service). The majority of these performance studies has been done on the levels of actor/egonetwork, dyad and chain, these have been executed by researchers with backgrounds in strategy or organization theory and supply chain or information management among others.

Provan et al. (2007 p. 481) roughly divided interorganizational network studies in 1) "network as a perspective" (using social network analysis and metrics) and 2) "networks as a form of governance". Many strategists and organization theorists often take the "networks as a perspective" approach and study horizontal alliances and performance on actor/egonetwork and dyadic level. Many supply chain and information management researchers have taken the "networks as a form of governance" approach and focused on production networks and performance on dyadic, chain and to a small degree on whole network level. The literature can be categorized by the theoretical mechanisms in interorganizational network research from the review of Zaheer et al. (2010): resource access, power/control and trust.[9] We add information/knowledge sharing to this classification and use it next to discuss performance on the four levels of analysis.

Networks as a perspective

Studies informed by one or more theories such as social capital (Coleman, 1988; Burt, 1992), resource dependence (Pfeffer and Salancik, 1978) and the resource-based (Wernerfelt, 1984; Barney, 1991) and relational view (Dyer and Singh, 1998), explain

[8] Performance on egonetwork level is how the surrounding network of a focal firm performs and therefore most often conceptualized as actor level performance, that is why these are grouped together here.

[9] We do not use the category signaling since there are very few studies in comparison to the other categories in interorganizational network research on performance, Stuart et al. (1999) is an exception.

actor performance by focusing on mechanisms of resource access and power/control, sometimes both. The underlying logic is that the quality of the ties, degree centrality of the firm and certain network positions, provide access to resources and information or control benefits; or that the network itself is a resource or source of competitive advantage. For example, Rowley et al. (2000) found that the amount of weak ties a firms has with alliance partners is positively related to return on assets in industries demanding a high level of exploration (semiconductor industry), while the amount of strong ties increased performance in environments of demanding a high level of exploitation (steel industry). Shan et al. (1994) found that the number of cooperative relationships of biopharmaceutical startups with both large private sector firms and research institutions was positively associated with innovation output measured in number of patents granted to a startup. Finally, Zaheer and Bell (2005) found that performance of innovative firms in terms of market share was further enhanced if these firms occupied a bridging position. Such firms were better able to exploit novel information, ideas and opportunities from structural holes in a network of board and management ties among mutual fund firms.

The network as a perspective line of work predominantly focuses on horizontal alliance networks and therefore rarely moves beyond the actor level in terms of performance.

Networks as a form of governance

Studies informed by one or more theories such as social capital (Coleman, 1988; Burt, 1992), resource dependence (Pfeffer and Salancik, 1978) transaction cost economics (Williamson, 1985), resource-based (Wernerfelt, 1984; Barney, 1991) and relational view (Dyer and Singh, 1998), knowledge-based view of the firm, information processing (Daft and Weick, 1984) and organizational learning (Huber, 1991) explain actor, dyadic and chain performance by focusing on mechanisms of resource access, power/control, trust and information/knowledge sharing.

The underlying logic that is that relational characteristics such as tie strength and degree of trust and integration affect performance by lowering transaction costs related to risk and coordination and other process and outcome improvements such as adaptation and efficiency.

Krause et al. (2007) show how the performance of buying firms in automotive and electronics industries is improved in terms of cost, quality, delivery and flexibility through buyer commitment and the perception of shared values and goals between buyers and suppliers. Vickery et al. (2003) study how integrative information technologies that increase the flow of relevant information between supply chain partners facilitate supply chain integration through supplier partnering and closer customer relationships. Strong relationships with suppliers and customers involve high levels of trust, commitment, joint conflict resolution, risk and reward sharing, information on customer preferences etc. which enhance customer service levels and in turn, the financial performance of automotive suppliers.

Uzzi (1997) found that in a production network in the apparel industry, features of embedded relations (trust, joint problem solving and fine-grained information transfer) improved dyadic performance in terms of allocative efficiency, Pareto improvements and complex adaptation. The work of Uzzi (1997) does in fact move beyond the dyad by discussing network-level effects and this is a rare exception for a study outside of the supply chain management discipline. The burgeoning supply chain management literature, has evolved onto higher levels of analysis, namely on chain and to some extent on network level. This also involves joint production of differentiated and complementary firms. The bullwhip effect in supply chains due to lack of coordination and information sharing, was already described in section 1.1 (Forrester, 1961; Lee et al., 1997).

Chains and networks are however separate levels of analysis. Chains are a set of dyadic relationships including a supplier, a supplier's supplier, a customer and a customer's customer (Croom et al., 2000). Supply chains represent specific combinations of firms whereas business networks consist of all the supply chains that are drawn to meet demand (Fung et al., 2008 p. 9). Essentially all the interconnected businesses involved in the ultimate provision of products and services required by end customers (Harland, 1996 p. 64) or also called a network of operations (Croom et al., 2000). The study of network performance in this literature is a relatively recent phenomenon (Morgan, 2007). Such studies will be analyzed in the following section. On the whole network level, there is a lower degree of coverage by the supply chain management literature than on dyadic and

chain level (see Croom et al., 2000 p. 72). Conceptualization, measurement and research design on firm level, limit the ability of researchers to develop and test theory on the behavior and performance of networks (Straub et al., 2004). Morgan (2007, p. 255) state "much of the supply chain research is still focused on the dyadic relationships that collectively and incrementally can be aggregated into approximations of supply network dynamics." That is why we will connect the supply chain literature to our findings from the literature analysis in coming sections 2.5 and 2.6.

To conclude this section, the above demonstrates the caveats in interorganizational network literature that will be filled through this work. We will do so by building foundations that will drive forward the inquiry on network level performance.

2.4 Dearth and Diversity

The need to shift the unit of analysis to whole networks of organizations and their outcomes has been identified in the literature. In the previous decade Provan et al. (2007) produced a comprehensive review on empirical work, which anticipated more research on network level outcomes and outlined directions for future research. However, so far, the literature on the performance of whole interorganizational networks still remains relatively limited. This holds for theoretical as well as empirical work. This is surprising given the proliferation of the network form of organization. This dearth, however, can be explained by the several methodological and theoretical reasons that make network performance research and network level research not impossible, but in general rather challenging compared to the other levels of analysis.

Methodological and Theoretical Challenges

First of all, research with the network as unit of analysis can be laborious and costly in terms of time and financial resources (Provan et al., 2007 p. 510). For the dependent variable, performance data on network level may not be readily available in the field. As for the independent variable, the joint production function of the network means that researchers have to uncover the impact of each link in the production process on network

performance (Sydow and Milward, 2003). Thus, for studying both sides of the relation in the field (performance and factors), this requires collecting data on a complete or representative set of organizations. For example, in the case study in this dissertation we conducted 25 interviews to research a single business network. This involved the commitment and cooperation of informants within the firms in this set. This requirement is intensified in the case of longitudinal studies and multiplied for comparative case studies. Second, multiple case studies present researchers with the risk of not having enough variation in the variables to compare the networks, something that would only show late in the research process (Raab and Kenis, 2009). Third, another cause for the scarcity is the lack of conceptual clarity on network performance. For firm performance we can choose accounting measures (e.g. market share, return on investment), financial market measures (e.g. market value, stock price) and mixed accounting/financial market measures (e.g. balanced scorecard) or survival (see Richard et al., 2009). A similar categorization with well-defined concepts does not exist yet for network performance. Also the matter why a network should be evaluated by using a specific concept is left largely untouched. The few network performance studies out there rarely motivate why they select a particular concept over others and why they choose to evaluate network performance from a particular perspective. Kenis and Provan (2009) call this one of the deficiencies of the network performance literature.

The supply chain management literature inherently has a view across multiple, coordinating firms. The concepts and measures used for evaluation of chains and networks in this stream can be helpful. However, networks are distinct from chains, chains are a subset of a business network (Vervest et al., 2004, p. 229). Business networks have a different operating logic than chains (Miles and Snow, 1992) in a chain firms collaborate, in networks firms can compete and collaborate depending on the order or time. Furthermore, the jump to theorizing on the performance of whole networks has only just begun in the supply chain management literature. In fact, theory building on network level performance has been carried out to a greater degree in the seminal works by organizational theorists in the public sector, mental health care in particular (e.g. Provan and Milward, 1995; Provan and Milward, 2001; Provan and Kenis, 2008). Overall, we will see, that development in the literature has been fragmented, with multiple definitions,

methods and measures for describing, explaining and capturing network performance. A comprehensive conceptualization is still lacking in the literature.

The following describes how we collected, analyzed and integrated the extant literature for the purpose of concept and framework building. To collect management literature that has conceptualized performance of interorganizational networks, the strategy detailed in Table 2.2 was adopted. The literature search procedure first started by retrieving full-text articles from academic peer reviewed journals on databases EBSCO Business Source Premier and ABI/INFORM Complete with respectively over 2,200 and 5,000 full-text publications on business and economics[10].

Table 2.2 Literature search procedure

Keywords	1) *In title* "network performance", "network outcome", "network effectiveness" , "network efficiency " AND *In text* firms, organizations 2) *In title* performance, outcome, effectiveness, efficiency AND *In text* "network level", "interorganizational networks", "business networks", "interfirm networks" "supply networks"
Databases	ABI/INFORM Complete *http://search.proquest.com/abicomplete* EBSCO Business Source Premier *http://web.ebscohost.com/ehost*
Search criteria	• Full-text/Academic/Peer-reviewed (first search) • Publications: Harvard Business Review, California Management Review and MIT Sloan Management Review (second search)
Results	Period of queries: November 2013 No. of queries academic journals: 24 No. of queries periodicals: 24 No. of articles generated: academic journals (676) periodicals (148) No. of articles selected: 20 No. of empirical studies: 15 No. of normative/theoretical studies: 5

The design of the table is adapted from Turrini et al. (2010)

[10] These databases have an overlap in titles but also unique titles e.g. European Management Journal and Journal of Accounting & Organizational Change, that is why both are utilized for literature search.

The keywords under 1) and 2) are used, at 2) we loosen the requirement for network to be in the title. Second, as research on network performance is relatively new a second search[11] was conducted within the following periodicals that publish on new themes in management: *Harvard Business Review*, *California Management Review* and *MIT Sloan Management Review*.

The literature selection procedure consisted of three steps. In the first step all query results were screened for title and keywords and at times the abstract to immediately discard numerous articles regarding teams and social and communications networks. Secondly, many studies that contributed to the knowledge on the performance of organizations or interorganizational relations (including those discussed in the previous paragraph) were also eliminated (e.g. respectively Goerzen, 2007; Duysters and Lokshin, 2011 and Beamish and Jung, 2005). This resulted in a list of 137 remaining articles. At the second step, the articles on this list were further analyzed on text and culled based on the following two criteria:

First, there should be a chosen conceptualization of performance on network level as opposed to firm, dyad or chain level. The central topic in the study should be either describing or explaining performance of a business network. This excludes studies such as Moore (1993) where the form of organization here ecosystem and its stages are the central topic and network performance or underperformance is implicit to the article. Another example is a study where the focus is on capacity of networks to diffuse knowledge and information and how organizational learning shapes buyer-supplier networks in Japan and vice-versa (Lincoln et al., 1998) without any explicit link to the performance of these networks. Instead there were studies in similar contexts that did conceptualize network performance (Iansiti and Levien, 2004b[12] and Dyer and Nobeoka, 2000). Here we also do not include advances in network performance on the selection of concepts for evaluation that discuss how and which processes, issues and conditions, influence the choice (Sydow

[11] Here all title search terms were all put in the text field since article titles of these periodicals do not always contain the terminology of the topic under study, often these are catchy phrases. Keyword searches became e.g. "network performance" AND firms in text.

[12] This study considers substantial parts of the business ecosystems of Microsoft and Wal-Mart that are consciously created (hence the term ecosystem management) therefore it is included in the analysis.

and Windeler, 1998; Morgan, 2004; Provan and Kenis, 2009; Whelan, 2011). Insights from such studies are used elsewhere in this dissertation. *Second*, the interorganizational networks in question have what is called a "joint production problem or function" i.e. networks must contend with the joint-production problem where multiple organizations produce one or more pieces of a single service or product (Provan and Milward, 2001). This excludes studies on the performance of alliance networks (Schilling and Phelps, 2007[13]; Thorgren et al., 2010) and horizontal networks (e.g. Human and Provan, 2000) where firms collaborate that are at the same stage in the value chain.

At the third step an additional relevant article that covered network performance based on the author's knowledge but did not contain the keywords above was added to the selection. The research objective is conceptualization and explanation therefore we included all types of studies: descriptive, explanatory, conceptual and empirical. These are the steps in the literature search procedure which generated a final list of 20 articles. While care was taken to run an extensive and thorough procedure, the list is not exhaustive per se. It could be the case that a few articles that qualified were not included, for instance if these involve other keywords and journals than covered above and are unknown to the author at this point.

Next we carefully analyzed the selected literature, first in terms of performance concepts and measures for conceptualization and second in terms of categories of factors for building a theoretical framework for explaining network performance.

2.5 Analysis

The selected literature indicates that the research on network performance is relatively scant and recent, only 20 studies done in the past twenty years. The number is very small especially in comparison with the overall literature on interorganizational networks. It shows that business network performance as an area of research, is still in its infancy. Table 2.3 classifies the selection of studies into dimensions of theoretical and empirical, and descriptive and explanatory studies.

[13] Although not explicitly mentioned in this article, the collective innovative output of firms in the various industries could be considered as a form of network performance.

	Descriptive	Explanatory
Theoretical	10%	15%
Empirical	0%	75%

Table 2.3 Classifications of literature

The majority of the articles are empirical, explanatory studies. In terms of the methodology of these studies, 6 used surveys, another 6 were conceptual studies, 4 used case studies, 2 applied mathematical modeling/case study, 1 agent-based modeling and 1 used secondary data. 75% of the empirical studies (15) used subjective or self-reported measures. This can be explained by the challenges of obtaining objective data on network performance. If such secondary data (e.g. financial performance, customer satisfaction) is not already available then it would be costly and time consuming for researchers to collect it themselves.

The selected literature was indexed in Table 2.4 based on journal, research method, network output, type of performance, evaluation perspective (Sydow and Milward, 2003) and type of measure (if applicable). Five articles are a line of inquiry by Provan and colleagues which represent significant contributions to theory building of network level performance. The column *journal* shows diversity, which is not surprising, since both interorganizational networks as well as performance management and measurement have always had the interest of various (management) disciplines. Network performance in these studies is often neither explicitly defined, nor the selected concept for evaluation explicitly justified. The use of single or multiple indicators are also often not explained or motivated. Richard et al. (2009) noted a similar taken-for-granted treatment of organizational performance in the literature.

Table 2.4 Network performance research and concept use

Nr.	Studies	Journal*	Method	Network output	Performance concept	Evaluation perspective	Measure
1 2	Provan and Milward (1995) Provan and Sebastian[14] (1998)	*ASQ* *AMJ*	Cross-sectional, multiple case study	Mental health care services	Effectiveness	Clients *Subjective (clients and families)*	Survey items on: Quality of life Client satisfaction Psychopathology Level of functioning
3	Nishiguchi and Beaudet (1998)	*Sloan*	Case study	Motor vehicles	Robustness	Firms *Objective*	Recovery of production in terms of days Competitive advantage
4	Dyer and Nobeoka (2000)	*SMJ*	Case study	Motor vehicles	Productivity	Firms *Objective*	Output per labor hour Inventory as percent of sales
5	Provan and Milward (2001)	*PAR*	Conceptual (but examples are given for measures)	Health and human services	Effectiveness	Community	Cost to community Building social capital Public perceptions that problem is being solved Changes in the incidence of the problem Aggregate indicators of client well-being
						Network	Network membership growth Range of services provided Absence of service duplication Relationship strength (multiplexity) Creation and maintenance of network administrative organization (NAO) Integration/coordination of services Cost of network maintenance Member commitment to network goals
						Firms	Agency survival Enhanced legitimacy Resource acquisition Cost of services Service access Client outcomes Minimum conflict for multiprogram agencies across multiple network

[14] These studies have been grouped since they concern the same data concepts and measures (on the dependent variable side), the 1998 article is a refinement of the theoretical mechanisms and specifically the structural antecedent in the early paper, clique structures rather than network centralization seem to drive network effectiveness.

Nr.	Studies	Journal*	Method	Network output	Performance concept	Evaluation perspective	Measure
6	Guimaraes, Cook and Natarajan (2002)	*DS*	Survey	Various manufacturing	Efficiency Customer satisfaction Financial performance	Firms *Subjective*	Survey items on: Delivery performance to commit date Fill rates Customer satisfaction with order Order fulfillment lead times Production flexibility Warranty costs and returns processing costs Value-added per employee Inventory days of supply Cash-to-cash cycle time Net asset turns (working capital)
7	Schumaker (2002)	*JHHS*	Survey	Healthcare services	Effectiveness Conflict	Firms *Subjective (organizations and network board directors)*	Survey items on performance gaps of: Achievement of network goals Adequacy of resources Smooth operations Productivity Effectiveness Satisfaction
8	Wan and Wang (2002)[15]	*HCM*	Secondary data	Healthcare services	Efficiency Financial performance	Firms *Objective*	Survey items on integration in terms of: Hospital utilization Outpatient utilization Contractual capabilities Financial position Physicians Services and access System-wide integration
9	Iansiti and Levien (2004b)[16]	*HBR*	Conceptual (but data was presented for the measures)	Not specified	Productivity Robustness Niche creation	Network *Objective*	Return on invested capital Number of firms

[15] The study considers average length of stay, technical efficiency and profit margin as drivers of network performance, we consider these as already as final outcomes of the network (i.e. network performance) hence these are excluded from the analysis.

[16] This study considers substantial parts of the business ecosystems of Microsoft and Wal-Mart that are consciously created (hence the term ecosystem management) therefore it is included in the analysis.

Nr.	Studies	Journal*	Method	Network output	Performance concept	Evaluation perspective	Measure
10	Straub, Rai and Klein (2004)	*JMIS*	Conceptual (the survey part is on dyadic level)	Logistics services	Effectiveness Efficiency	Firms *Subjective*	Inventory turnover Days on hand of inventory Net trade cycle Absorption margins for inventory Fixed assets and accounts receivable Working capital efficiency Operating margins
11	Bodnár, Dankó, Drótos, Kiss, Molnár and Révész (2006)	*S&E*	Conceptual	Local health care services	Effectiveness Efficiency	Firms	--
12	Clarke (2006)	*MD*	Survey	Drug misuse or prevention services	Effectiveness Efficiency	Clients *Subjective* *(chairs and coordinators)*	Survey items on: Implementation of drug education Prevention/education plans Maximum waiting time
13	Kenis and Provan (2006)	*IPMJ*	Conceptual	Public goods	Effectiveness	Community	--
14	Ye and Farley (2006)	*IJMS*	Agent-based modeling	Products (not further specified)	Effectiveness	Firms *Objective*	Average local fitness of an agent (absolute value of inventory minus demand)
15	Provan and Kenis (2008)	*JPART*	Conceptual	Services (not further specified)	Effectiveness	Community Clients	--
16	Lindencrona, Ekblad and Axelsson (2009)	*PMR*	Survey	Refugee settlement services	Network performance	Clients *Subjective (organizations)*	Survey items on: Comprehensiveness of services Compatibility of services Accessibility of services Responsiveness to clients Network learning
17	Allesina, Azzi, Battini and Regattieri (2010)	*IJPR*	Mathematical modeling Case study	Products (Industrial catering equipment)	Efficiency	Firms *Objective*	Total system throughput Average mutual information Ascendancy Development capacity Overhead in import Overhead in export Overhead and dissipations Redundancy

Nr.	Studies	Journal*	Method	Network output	Performance concept	Evaluation perspective	Measure
18	Moeller (2010)[17]	*JAOC*	Survey	Not specified	Effectiveness Efficiency	Firms *Subjective*	Survey items on reaching objectives for: Value creation Increase in profit Sales growth Reduction of production costs
19	Zelbst, Green, Sower and Reyes (2009)	*IM&D*	Survey	Manufacturing and services (not further specified)	Effectiveness Efficiency	Customers *Subjective (Firms)*	Survey items on: Zero-defects Value-added services Order quality Problem solving Order quantity Total product cost Waste Safety stock minimizations
20	Shukla, Lalit and Venkatasubramaniam (2010)	*IJPD&L*	Mathematical modeling Case study	Automobiles	Robustness Efficiency	Network	Expected disruption costs Operation costs (sum of infrastructure, material handling and transportation cost)

* ASQ = Administrative Science Quartely, AMJ = Academy of Management Journal, Sloan = MIT Sloan Management Review, SMJ = Strategic Management Journal, DS = Decision Sciences, JHHS = Journal of Health and Human Services Administration, HCM = Health Care Management Science, HBR = Harvard Business Review, JMIS = Journal of Management Information Systems, S&E = Society & Economy, MD = Management Decision, IPMJ = International Public Management Journal, IJMS = International Journal of Modeling and Simulation, JPART = Journal of Public Administration Research and Theory, PMR = Public Management Review, IJPR = International Journal of Physical Distribution & Logistics Management, JAOC = Journal of Accounting & Organizational Change, IM&D = Industrial Management & Data Systems, IJPD&L = International Journal of Physical Distribution & Logistics Management

We shall focus now on the development of the concept of network performance. When evaluating the performance of a network, different points of view can be taken. The type of outcome considered depends on the constituency or stakeholder view that is taken (Provan and Milward, 2001).

When analyzing and comparing the articles based on the type of outcome (see column 7 *evaluation perspective*), three distinct views emerged on network performance: either from inside the network (firms), from outside of the network (customers, clients, community) or from on the network itself. This finding triggered the development of three lenses of network performance which we term: the *firm, customer* and *systems lens*.

We will next describe each of these lenses and provide definitions.

[17] While this study sampled different networks (vertical, horizontal and lateral) it is still included in the review since vertical networks are represented and the factor commitment (see Table 2.6) is found in another study as well.

2.6 A Typology of Network Performance: Three Lenses

Each lens corresponds with a particular view of the network. Figure 2.3 illustrates their foci by adding them to the representation of a business network from before.

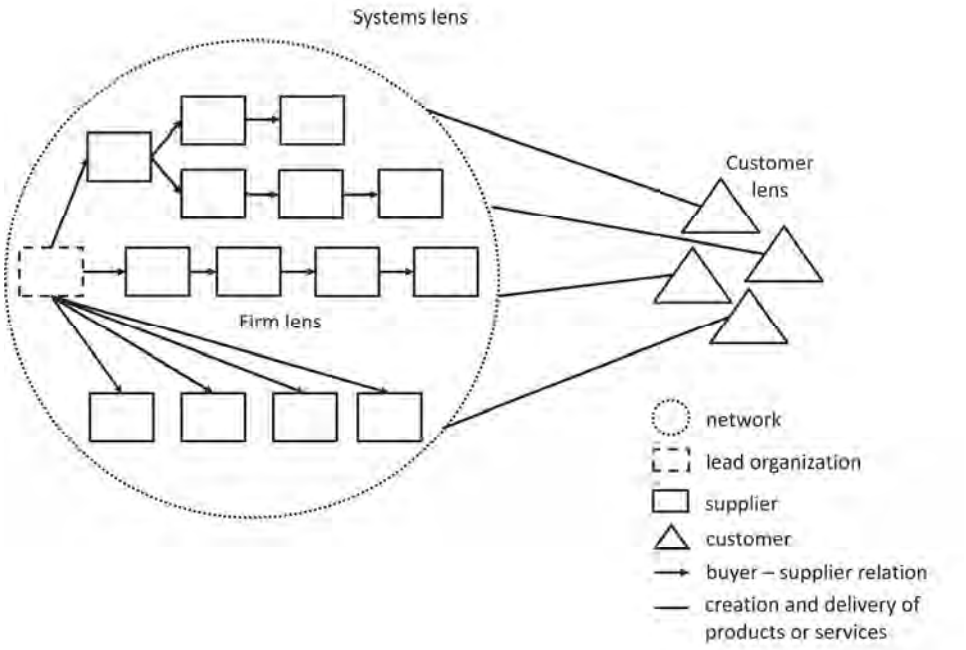


Figure 2.3 Three lenses on business network performance

In the following sections we will discuss the three lenses. We use the selected studies and concepts, however since comprehensive conceptualization has not yet taken place, we also enrich each lens by connecting to literature on other levels of analysis. Several management theories have emphasized one or more concepts for performance evaluation of organizations that we will use. For example, population ecology puts survival forward as central concept (Hannan and Freeman, 1977; Sydow and Milward, 2003).

2.6.1 The Firm Lens

The majority of the selected articles took the view of the firms in studying network performance. The authors view *interorganizational networks as institutional arrangements*. These studies use either financial or operational concepts and measures. The central theme is what firms gain from participation in the network or how effectively or efficiently the firms in it operate. Often network performance is the aggregate or average of firm performances (e.g. Dyer and Nobeoka, 2000; Ye and Farley, 2006: Moeller, 2010). We term this the firm lens on business network performance which focuses primarily on the results for the firms themselves. Its central concepts cost efficiency and effectiveness originate from transaction cost economics, game theory and resource dependence and this point of view on performance has been taken in supply chain management and structural hole/social capital theory.

In the past, Jarillo (1988) equated the basic conditions for the existence of networks with those for individual firms, at a basic level networks should be effective and efficient (Barnard, 1968). To come into existence, networks need to be the most efficient arrangement in terms of the transaction and switching costs that firms incur. This cost efficiency criterion is what has been used to explain the prevalence of networks over markets and hierarchies (Williamson, 1991).

Within the network form of organization, it is also possible to assess differential cost efficiency of alternative network governance forms (Provan and Kenis, 2008), where metrics can, for instance, be time consumed by negotiations and complexity of the written agreement (Sydow and Windeler, 2003). Such evaluations view performance from a within-network stance, as did much of the early supply chain management literature where the efficient execution of processes within the chain or network were central (e.g. Langabeer and Rose 2001).

For supply networks, Straub et al. (2004) in fact, adopt the firm lens by matching the mutual information sharing practices of clients and vendors and to their perceptions of subsequent performance impacts that are associated with these firms. The measures for network performance that these authors (p. 94) propose, are aggregations of individual firm performances such as operating margins, net trade cycles and working capital

efficiency. In the latter part of their work these authors use subjective performance evaluations of dyads and suggest scaling these measures to networks. The performance items concern seven-point Likert scale items on increased productivity, reduced workflow, improved production planning (p. 97). In a similar fashion, Moeller (2010) assessed performance through surveying accounting managers' perceptions of achieving their objectives regarding sales growth and reduction of production costs, value creation and increase in profit. Future studies following the line of inquiry of Straub et al. (2004) and Moeller (2010) would examine network performance by aggregating individual firm performances per network or time unit. For a review of organizational performance measures see Richard et al. (2009), where a division was made into accounting, financial, mixed accounting/ financial.

Next to cost efficiency, Jarillo (1988) discussed that in order for networks to endure, firms' participation in the network should entail superior performance or to the creation of "more pie to share". This refers to what a firm is able to appropriate and represent in its accounts from participating in the network (Sydow and Windeler, 1998). Firms obtain value from participation in the network and "fair" value sharing mechanisms need to be in place. When assessing network performance in terms of the value appropriation of firms such as for instance profit, calculating network performance can be a zero-sum game, one supplier's gain would imply a buyer's loss. Some firms are better positioned than others to reap the benefits of participation in networks.

However, in networks it is also possible to realize synergy or rents which are supernormal profits that can only be jointly generated by firms and not by either firm in isolation (Dyer and Singh, 1998, p. 662). Based on our discussion we provide the following definition:

Definition 2: *Network performance seen through the firm lens is the ability of the network to obtain outcomes that fulfill the economic, financial and operational objectives of the organizations in the network.*

2.6.2 The Customer Lens

More than half of the articles with network performance concepts that are outcomes for customers involve health and human services. The authors look at *interorganizational networks as production* for recipients outside the network. Often the organizations in the network are asked to assess network performance for outside parties (customers, clients, community) (Provan and Milward, 1995; Provan and Sebastian, 1998; Lindencrona et al., 2009). The community is defined as any local area that directly or indirectly benefits from the services delivered by the network (Provan and Milward, 2001). Sometimes the point is made that the optimization of the whole comes first, even if this is at the expense of any individual organizations which makes sense in public management (Provan and Milward, 1995). We term this the customer lens which focuses on outcomes for parties that are not part of the network but that are the recipients of what is being brought forward by the network as a whole. The main concepts are market efficiency, flexibility and effectiveness which find their origin in the resource-based view and contingency theory and evaluation through this lens has taken place in the supply chain and marketing management literature. The resource-based view posits that the competitive advantage of a firm lies primarily in the application of the bundle of valuable rare, inimitable and non-substitutable resources at the firm's disposal (Wernerfelt, 1984; Barney, 1991). Contingency theory proposes that the right organizational structure, leadership, decision making for any firm is dependent upon the internal and external environment (Burns and Stalker, 1961).

About a decade ago, the supply chain management discipline started distinguishing chains that are supply-driven and demand-driven (De Treville et al. 2004; Frohlich and Westbrook 2002; Vollmann et al. 2000). The customer lens on network performance is related to what has been termed demand chain management or market driven organizations, where customer oriented measures are also being taken into account. Rather than only focusing on efficient supply chain performance, demand chain management focuses on catering to customer segments and individuals (Vollmann et al. 2000; Langabeer and Rose 2001; Heikkilä 2002) while favoring speed and flexibility over cost (Aitken et al. 2002; Fisher et al. 1997). Especially for the business networks that need to be able to quickly and adequately respond to changing and complex customer needs (e.g. travel, clothing) network performance in meeting customer demands is vital. The ultimate

test is how end customers perceive and evaluate the offerings which competing networks provide (Möller and Svahn, 2003). Performance evaluation through this lens would consider concepts such as customer responsiveness and customer satisfaction. For example, Provan and Sebastian (1998) evaluate the effectiveness of mental health service delivery networks in three U.S. cities through interviews and surveys with clients and their families conducted by a clinical psychologist. They used five-point Likert-scale responses to questions concerning the clients' quality of life, adjustment, satisfaction with services, and psychopathology.

The supply chain management and marketing literature offer a variety of measures such as customer response times which can be absolute or relative to networks of specific competitors (Brewer and Speh, 2000) or the industry norm; and range of products and services, product returns, on-time delivery, customer lead or query times (Gunasekaran et al., 2004) and after sales service measures. From the discussion follows this definition:

Definition 3: *Network performance seen through the customer lens is the ability of the network to obtain outcomes that provide value for end customers.*

2.6.3 The Systems Lens

A few articles have a more holistic view in discussing network performance (Provan and Milward, 2001; Iansiti and Levien 2004b). The authors view *interorganizational networks as functionality*. They view the network as a system and make normative statements such as "it must become a viable organizational entity if it is to survive", "to operate effectively member agencies must act as a network" and "to function effectively each domain in it that is critical to the delivery of a product or service should be healthy". Vervest et al. (2004) described this ability of a business network as fault tolerance. We term this the systems lens for business network performance which focuses on the operation and endurance of networks. Its central concepts robustness, diversity, adaptation and survival are derived from population ecology (Hannan and Freeman, 1977) and systems theory (Wolfram, 1988).

Systems theory studies how relationships between parts give rise to the collective behaviors of a system and how the system interacts and forms relationships with its environment. A stream in the literature on complex systems discusses complex networks as diverse as the World Wide Web and protein-interactions and topological robustness which refers to the ability of a network to remain connected and retain functionality under errors or attacks (e.g. Albert et al. 2000; Barabasi and Bonabeau 2003). Even with the removal of a small fraction of nodes, these network structural properties such as the diameter of the network, remain the same. This is known as topological robustness. However, these networks are extremely vulnerable to targeted attacks, i.e. to the selection and removal of a few nodes that play the most important role in assuring the network's connectivity.

Saavedra et al. (2008) study this phenomenon of topological robustness for a declining interfirm network of designers and contractors in the apparel industry and found, in spite of a substantial net loss of nodes, a relatively stable topology and functionality. Functionality is measured here as the fraction of bilateral transactions that include refunds per year (i.e. errors). However in the discussion, topological robustness itself is emphasized more as an outcome or performance of the network. While Saavedra et al. (2008) focus on one stage in the production process (dyads of designers and contractors), disruptions of entire supply chains have also been described where next to topological robustness, robustness is also related to the capabilities and characteristics of firms. For example, when a fire destroyed the plant of Toyota's sole supplier for a brake-related part in 1997, there was network-wide effort by the suppliers of Toyota where temporary sites were set up by them to recover production. It allowed Toyota to resume full production of its cars in nine days instead of several weeks, thereby minimizing losses from this incident (Nishiguchi and Beaudet, 1998). The measures of robustness that come across from such cases (e.g. response times, predisaster levels of functioning) are described in the literature on disaster relief / emergency response management (e.g. Green and Kolesar, 2004; Kapucu, 2005). Such as the time that elapses before a disruption is being handled by one or more firms in the network or the time that it takes to restore system functionality as with such a fire.

Next to natural catastrophes, economic, political and health crises can also disrupt business networks, such as devaluations, civil wars or outbreaks of disease. Li and Fung (mentioned in section 1.1) operates a network of suppliers across Asia and is able to divert textile manufacturing from high-risk to low-risk countries in such cases (Fung et al., 2008). Summing the total of prevented losses from such disruptions can be an indicator of network performance. Measuring robustness of the networks to disruptions can be done ex post after disruptions have taken place but there are also strategies for enhancing robustness e.g. a flexible supply base, flexible transportation, strategic stock and postponement of product differentiation (Tang, 2006) or supply network design and scenario planning (Shukla et al., 2010). The execution of these strategies can lead to valid proxies for capturing the robustness of business networks ex ante.

There are shocks, such as the ones described above, that disrupt and threaten the current functioning of business networks but there are also shocks that have the potential to shift business network models and change their structure and composition. These disruptions are of a more long term nature and resilience or adaptation is the ability of a network to persist or adjust when these environmental changes occur. Networks can be permanently altered by technological developments but also through regulatory changes such as the deregulation of the insurance industry. Such shocks can radically change business networks and threaten firms' positions within them or create new roles (Kambil and Short, 1994). Networks that are highly resilient are those where the relationships among network members are buffered against perturbations (Hamel and Välikangas, 2003; Iansiti and Levien, 2004ab). This concept and view on performance corresponds with population ecology theory of organizations (Hannan and Freeman, 1977). Population ecology studies the environment in which organizations compete and a process like natural selection occurs. The theory highlights the death of organizations (firm mortality), the birth of new organizations (organizational founding), organizational growth and change. Iansiti and Levien (2004b) offer metrics for resilience and adaptation such as survival rates of network members, persistence of network structure, predictability, limited obsolescence, continuity of use experience and use cases.

Based on the discussion above, we provide the following definition:

Definition 4: *Network performance seen through the systems lens is the ability of the network to handle internal and external shocks that threaten its functioning and continuity.*

We now conceptualize network performance using the insights from previous discussions. This definition draws upon all three theoretical lenses:

Definition 5: *Network performance is defined as the ability of the network to fulfill the objectives of member organizations, provide benefits and recurring value for end customers under multiple conditions including internal and external shocks.*

The development of the three lenses also leads to the following implication that Richard et al. (2007) proposed for organizational performance, that measuring network performance requires weighing the relevance of performance to focal stakeholders. We propose the following guideline for further theory development in interorganizational network performance research:

Guideline 2: *Theory building regarding network performance in interorganizational networks is enhanced by authors' explicit specification and justification of the lens and performance type of interest: firm, customer or systems.*

2.6.4 Complementarities and Trade-offs of the Three Lenses

Table 2.5 summarizes the theoretical discussion in the previous section. Each lens has key concepts and is related to certain main stakeholders. Through the discussion it can be noticed that when one moves from evaluating network performance through a firm lens to a systems or customer lens, it becomes relatively more difficult to disaggregate performance of the network and assign achievements to dyads or single organizations. Let us take example of the Toyota production network in section 2.2.

Table 2.5 The three lenses on network performance

Lens	Definition of Performance	Key Concepts[18]	Individual firm attribution	Main stakeholders	Foundational theories
Firm	*Network performance seen through the firm lens is the ability of the network to obtain outcomes that fulfill the economic, financial and operational objectives of the firms in the network.*	Cost Efficiency Effectiveness	High	Managers, shareholders	Transaction cost economic, game theory, resource dependence
Customer	*Network performance seen through the customer lens is the ability of the network to obtain outcomes that provide value for end customers.*	Market efficiency Flexibility Effectiveness	Low	Customers, consumer organizations	Resource-based view, contingency theory
Systems	*The ability of a network to handle internal and external shocks that threaten its functioning and continuity.*	Robustness Diversity Resilience Adaptation	Medium	Industry associations, policy makers, employees	Population ecology

We can use the firm lens and evaluate network performance as productivity increase or inventory reduction (Dyer and Nobeoka, 2000). Network performance in this sense, is the mere collection of individual firm and dyadic performances. However, when using the robustness of this supplier network in case of a fire or other crisis as the performance concept, then it can also be the combined effort and abilities of suppliers that make the network robust. Similarly, the levels of satisfaction of car owners of one the Toyota brands are the result of the combined efforts and coordination between suppliers, retailers and after sales service and repair companies.

Performance has already in the past, been identified as a multidimensional construct and these dimensions need not correlate strongly. For instance, a firm can perform highly on market share but low on profitability. The firm lens and customer lens are however connected. If the network provides recurring value for customers then firms within the network will most likely benefit from this, although some firms may be in a position to

[18] The column is not exhaustive but it represents the main concepts from each perspective.

gain more than others. Underperformance as seen through the firm lens could lead to some firms exiting the network, but underperformance through the customer lens means that many firms in the network will be disadvantaged. Underperformance over a continued period of time is likely to lead to the dissolution of the network, firms will not be able to survive or decide to discontinue network membership. Moreover, becoming out of step with the environment such as Uzzi (1997 p. 58) describes with overembeddedness can threaten the existence of the network and the fate of all firms as well.

Hence, although different dimensions of performance are emphasized when evaluating through each of these lenses, there are links between them because they capture the same construct. There are also performance trade-offs between the lenses[19]. The tension between firm and customer lens is intuitive, if firms extract much value from the network this could be at the expense of customers and vice-versa. Also if firms create a very robust network, it is likely to not be the most efficient way of producing because there will be idle capacity, showing the tension between the systems and firm lenses. In conclusion, we expect the three lenses to complement rather than substitute each other and therefore propose:

Proposition 1: *Network performance is a multi-dimensional construct*

2.7 Explanatory Studies on Network Performance

Next we focus on explaining network performance and take the 18 *explanatory* studies (of the total 20[20]) from Table 2.4 and analyzed and categorized the identified drivers of network performance. Table 2.6 contains the relations between the drivers (concepts and variables) and network performance that were identified in the empirical and theoretical studies in the literature selection. Through analysis of these studies we aim to build a framework for explaining network performance while considering both parsimony of the model and generalizability of mechanisms (Whetten, 1989) to a wide variety of business networks as we have defined at the end of section 2.2.

19 Exploring performance trade-offs in depth is beyond the scope of this dissertation, this is however an important part of the discussion on future directions on network performance theory development see section 5.5.

20 Provan and Milward (2001) and Iansiti and Levien (2004b) are descriptive (or non-explanatory) studies

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
1	Dyer and Nobeoka (2000)	Firm	Productivity Efficiency	Institutionalized, network-level knowledge acquisition, storage and diffusion processes (supplier association, operations management consulting division, voluntary small group learning teams, interfirm employee transfers)	Positive effects	Knowledge sharing Information sharing	Network processes
				Network identity (a sense of shared purpose with the collective)	Positive effects	Network stability	Network structural characteristics
2	Guimaraes, Cook and Natarajan (2002)	Firm	Efficiency Customer satisfaction Financial performance	IT Use effectiveness (use of information systems to e.g. improve customer service, reduce order cycle time) (type of information exchanged by trading partners, purchasing, engineering, product quality, production control, transportation, payment information)	Positive effects	Integration	Network structural characteristics
						Information sharing	Network processes
				Supplier relations depth (e.g. mutual commitment and understanding, similarity in pattern of shared values, willingness to participate)	Positive effects	Network stability	Network structural characteristics
				Industry clockspeed (e.g. rate of change in dominant production process and/organizational paradigms)	Moderating effects	System stability	Network contextual characteristics

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
3	Schumaker (2002)	Firm	Effectiveness	Sequential task integration (patient flow from one agency to the next instead of reciprocal or team integration where multiple agencies treat patients together)	Positive effects	Integration Network structure	Network structural characteristics
				Connectivity (use of all possible linkages) (compatible culture) (clear goals and objectives, inter agency committees, strategic planning)	Positive effects	Network structure Network stability	
						Network governance	Network processes
				Group methods of coordination (having a strategic plan developed by all members)	Positive effects	Network governance	
4	Wan and Wang [21](2002)	Firm	Efficiency Financial performance	Network size	Positive effects	Size and composition	Network structural characteristics
				Number of affiliated physicians	Positive effects	Size and composition	
				Executive decision support systems	Positive effects	Size and composition	
5	Straub, Rai and Klein (2004)	Firm	Effectiveness Efficiency	Degree of symmetric information sharing (on e.g. cost structures, production schedules)	Positive effects	Information sharing	Network processes
				Degree of symmetric dependence (e.g. customized versus generic applications used for information exchange with the vendor, efforts and costs of switching to a new vendor)	Positive effects	Integration	Network structural characteristics
6	Bodnár, Dankó, Drótos, Kiss and Révész (2006)	Firm	Network effectiveness Network efficiency	Degree of domain consensus (agreement on the appropriate role and scope of each agency, symbiotic or competitive cooperation)	Positive and negative effects	Network stability	Network structural characteristics

[21] Average length of stay, technical efficiency and profit margin are not included here because these can be considered as already performance measures

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
				Degree of ideological consensus (agreement on the nature of the tasks faced, shared assumptions and values)	Positive effects	Network stability	Network structural characteristics
				Degree of trust (positive evaluation of other organizations)	Positive effects	Network stability	
				Degree of work coordination (alignment of work patterns and culture)	Positive effects	Network stability	Network processes
				(task complexity)	Positive effects	Integration	
				(autonomy and authority) (information sharing)	Positive effects	Network governance Information sharing	
7	Ye and Farley (2006)	Firm	Effectiveness	Autonomy (firms can set their own production levels)	Negative effects	Network governance	Network processes
				Information sharing level (awareness of demand of downstream firms)	Mixed effects[22]	Information sharing	
				Network homogeneity (all firms adjust production levels under the same conditions)	Positive and moderating effects	Actor strategies	
				Market condition (stable, increasing, decreasing, volatile demand functions)	Moderating effects[23]	System stability	Network contextual characteristics

[22] Performance increased for homogeneous networks i.e. firms began with the same production level and changed production under the same conditions but declined for heterogeneous networks.

[23] The volatile market condition strengthened the main effects on network performance found in this study.

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
8	Allesina, Azzi, Battini and Regattieri (2010)	Firm	Efficiency[24]	Management strategies (reduce steel scrap, recycling goods via subcontractor, cut redundant connections, provide direct shipments of finished products, reduce the number of raw materials suppliers)	Positive effects	Actor strategies	Network processes
9	Moeller (2010)	Firm	Effectiveness Efficiency	Network commitment (e.g. network evolution is pivotal for long-term evolution of each partner, strategies are aligned to the business network)	Positive effects	Network stability	Network structural characteristics
10	Provan and Milward (1995)	Customer	Effectiveness	Centralized integration (core agency centrality in networks of service and organizational links)	Positive effects	Network structure	Network structural characteristics
				(concentration of influence)	Positive effects	Network governance	Network processes
				Direct non-fragmented external control (direct state funding and fiscal monitoring instead of local or multiple funding authorities which need to be monitored and controlled)	Positive effects	External control	Network structural characteristics
				System stability (changes in the funding and delivery of services) Resource munificence (level of funding)	Moderating effects Moderating effects	System stability Resource munificence	Network contextual characteristics

[24] Network efficiency was measured using eight entropic indices used for natural ecosystems: total system throughput, average mutual information, ascendancy, capacity and overheads of input, export, dissipation and redundancy. These indices are based on all the exchanges of goods in the supply network and measure its complexity.

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
11	Provan and Sebastian[25] (1998)	Customer	Effectiveness	Multiplex clique integration (overlapping cliques of service links i.e. both case coordination and reciprocated referrals between provider agencies)	Positive effects	Network structure	Network structural characteristics
12	Clarke (2006)	Customer	Effectiveness Efficiency	Affective commitment (emotional attachment to the network, e.g. belief that collaboration in this network will improves outcome for service users)	Positive effects	Network stability	Network structural characteristics
13	Kenis and Provan (2006)	Customer	Effectiveness	Control mode (personal centralized, formal bureaucratic, output, cultural or clan and reputational control)	Effects contingent upon fit[26]	Network governance	Network processes
14	Zelbst, Green, Sower and Reyes (2009)	Customer	Effectiveness Efficiency	Power (e.g. a firm's amount of influence over the cost of resources from suppliers) Risk reduction (e.g. buyers and suppliers reduce the uncertainty a firm faces)	Positive effects Positive effects	Network governance Network stability	Network processes
				Benefits[27] (from standardization of procedures with buyers and suppliers)	Positive effects	Integration	Network structural characteristics

[25] These studies have been grouped since they concern the same data concepts and measures (on the dependent variable side), the 1998 article is a refinement of the theoretical mechanisms and specifically the structural antecedent in the early paper, clique structures rather than network centralization seem to drive network effectiveness.

[26] Provan and Kenis (2006) develop several propositions on explaining network effectiveness based on the fit of the control mode (personal centralized, formal bureaucratic, output, cultural/clan control or reputational control) with the size of the network, task interdependence within the network and environmental uncertainty, complexity, heterogeneity the network faces.

[27] Benefits already represent performance outcomes see p. 671 of the article, the items on standardization imply integration that is why these were included.

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
15	Provan and Kenis (2008)	Customer	Effectiveness	Network governance mode (participant, lead-organization and network administrative organization governance)	Effects contingent upon fit[28]	Network governance	Network processes
16	Lindencrona, Ekblad and Axelsson (2009)	Customer/ Systems	Network performance - Services provided - Responsiveness to clients - Network learning	Mode of interaction (network steering group) (multi-organizational teams) (multiplex coordination i.e. both network steering group and multi-organizational team present)	 Positive effects Some effects positive Positive effects	Network governance	Network processes

[28] Provan and Kenis (2008) develop several propositions on explaining network effectiveness based on the fit of the governance mode with the size of the network, trust, goal consensus, need for network level competencies.

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
17	Nishiguchi and Beaudet (1998)	Systems	Robustness Competitive advantage	Problem solving, coordination and learning capabilities and routines of suppliers (e.g. flexible employee deployment and procedures,	Positive effects	Size and composition	Network structural characteristics
				Mutual dependence (of suppliers on lead organization for future contracts and of lead firm on suppliers because of Just-In-Time production)	Positive effects	Integration	
				Group norms (agreements and understanding among group members regarding technology, management, information and knowledge sharing)	Positive effects	Network stability	
				Trust (e.g. assuming fair compensation occur and that other firms will not take advantage of the situation and obtain proprietary information or new contracts)	Positive effects	Network stability	
				Information sharing among suppliers (of valve designs and process instructions)	Positive effects	Information sharing	Network processes
				Knowledge sharing among suppliers of the same tier (e.g. through problem solving study meetings and groups, regular employee transfers)	Positive effects	Knowledge sharing	
				Promoting cooperation (lead firm investments in supplier capabilities, trust and commitment)	Positive effects	Actor strategies	

Table 2.6 Main concepts and categories

Nr.	Study	Lens	Type of performance	Concept (variable)	Relationship	Main Concept	Category
18	Shukla, Lalit and Venkatasubramaniam (2010)[29]	Firm/ Systems	Robustness Efficiency	Scenario planning	Positive effects	Actor strategies	Network processes
				Supply network design	Positive effects	Network structure	Network structural characteristics

[29] This study is included although the analysis covers a manufacturing center and its warehouses because the issues of scenario planning and supply network design and warehouse or transportation disruptions are equally relevant if the warehouses belonged to external suppliers (the costs of installing a warehouse would be replaced by costs of contracts), also the article's introductory examples discuss external suppliers.

We analyzed the drivers in terms of the concepts, variables and overlap in meaning and grouped these into main concepts such as network structure, information sharing or network governance. In some cases when a concept actually covered two main concepts we teased it apart and assigned each part to a main concept. Connectivity in the Schumaker (2002) study is such an example, different dimensions of this concept covered network structure (use of all possible linkages), network stability (compatible culture) and network governance (clear goals and objectives, inter agency committees, strategic planning). These main concepts were then classified into categories of either network structural characteristics, network processes or network contextual characteristics. For this we build on the classification in the framework of Turrini et al. (2010) on public network effectiveness. The resulting framework is presented in Figure 2.4, the related propositions 2 until 7 will be developed in the following sections.

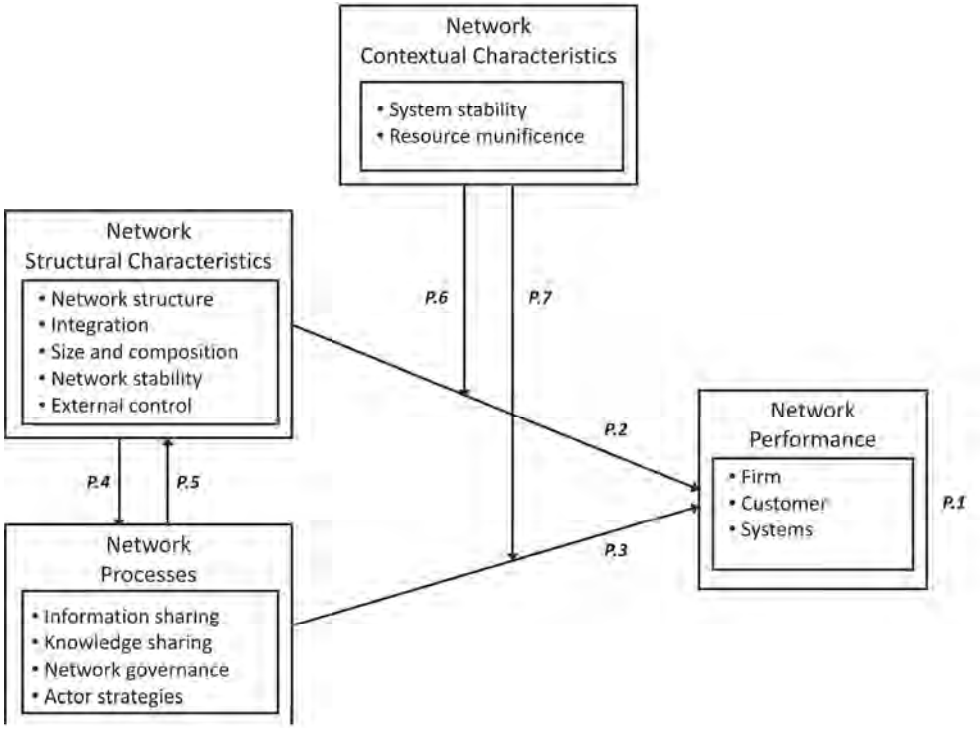


Figure 2.4 Preliminary integrated framework of network performance I

Our framework deviates from Turrini et al. (2010) in terms of the conceptualization of network performance, processes information and knowledge sharing and absence of contextual characteristic cohesion and support from the community/participation. This is because our search included the supply chain literature and networks of for-profit firms. However, apart from this the factors do correspond although our analysis resulted in different labels and the grouping of factors into categories. It is a good sign that the framework that arises, conforms to the framework of Turrini et al. (2010) which prevents fragmentation in the literature. At the same time, there is room under these umbrella categories for different concepts that emerge from our analysis of other network performance studies such as information and knowledge sharing and actor strategies.

We intend to build a framework broad and basic enough to be used for business networks in the private and public sector. For that purpose we would subsume formalization, accountability, buffering network instability/nurturing stability, network steering processes, generic networking (see Turrini et al., 2010) under network governance and traditional managerial work under actor strategies. Furthermore we would group cohesion and support from the community/participation under system stability.

As network performance is a nascent area of research such frameworks including ours are works-in-progress and aim to draw together studies and insights thus far, to build interorganizational network theory through a common understanding of the determinants of network performance.

2.7.1 Network Structural Characteristics

Network structural characteristics are a category that emerged from the literature analysis that deals with the configuration of the network. The main concepts identified here are: network structure, integration, size and composition, network stability and external control. Network structural characteristics describe the way the network is set up, the infrastructure in place for the operation of the network in the broadest sense of the word.

Network structure is defined as the overall exact pattern of ties that is formed between nodes. Provan and Milward (1995) and Provan and Sebastian (1998) described how centralization around a core agency or densely connected clique structures with multiplex ties, showed to better support the effectiveness of the service delivery network through strong centralized control or decentralized control through close cooperation among subsets of the network. Integration describes the extent to which organizations are joined together through their business processes, information systems and investments into relations. Straub et al. (2004) found that dependence of both clients and logistics vendors on each other through customized applications to facilitate information exchange was positively related to network efficiency in terms of increased productivity, improved production planning and so on. Size and composition entails the types of organizations that form the business network, their resources and capabilities. Wan and Wang (2002) showed that for networks of hospitals, the network size, number of affiliated physicians and presence of executive decisions support systems increased ranking of these health care networks in consecutive years. Network stability refers to the alignment of organizations with the business network and with other organizations, it contains elements of network identity, commitment, trust, shared norms and values. Both Guimaraes et al. (2002) and Bodnár et al. (2006) show how shared values positively impact the efficiency of respectively manufacturing networks and health provision networks through enhanced communication and coordination. External control is not identified in other studies in the literature selection apart from Provan and Milward's public network study (1995). Network structural characteristics and its main concepts turned out to be important factors of network performance viewed through all three lenses. We thus put forward the following proposition:

Proposition 2: *Network structural characteristics are, all else being equal, main determinants of network performance*

2.7.2 Network Processes

As in Turrini et al. (2010)[30] this category also emerged from our analysis, describes the behavior and processes that occur within structure. Network processes concerns all processes in the network within the configuration that contribute or disadvantage the joint production function. Within this category of network processes, the concepts information sharing, knowledge sharing, network governance and actor strategies were grouped. At the end of this chapter we will see that these processes are connected.

Dyer and Nobeoka (2000) detailed how knowledge sharing processes within the Toyota supplier network contributes to the network efficiency and productivity. Ye and Farley's (2006) simulation study showed how demand information shared among firms in supply networks increase the ability of the network to fulfill all demand. Network governance describes the steering of the network, the development of focused strategies and interventions, the use of institutions, authority structures and other means to allocate resources and to coordinate activities (Provan and Kenis, 2008). This relates to decision-making processes and leadership styles. Network governance also includes the explicit or implicit influence that organizations have on the decision making and actions of other organizations in the network. Schumaker (2002) identified that group methods of coordination such as collective development of strategic plans positively impacted the performance of rural health delivery networks.

Actor strategies refer to organizations' strategizing and action that can affect structural characteristics of the network for instance the network structure and size and composition of the network. Allesina et al.'s (2010) study covers a variety of management strategies such as disintermediating companies shipping directly to customers and reducing the number of raw material suppliers and their positive effects on network efficiency. Ye and Farley (2002) model actor strategies in networks as firm's adjustments of production level in response to demand. Worthy of mentioning here, is a specific type of actor strategy, namely buffering network instability which entail actions that enhance the network stability such as when a lead organization promotes collaboration among other

[30] Contrary to Turrini et al, (2009) the label network processes is used instead of network functioning characteristics since functioning tends to be associated with performance outcomes.

organizations in the network (Nishiguchi and Beaudet, 1998) or when scenario planning efforts are made to account for disruptions (Shukla et al., 2010). All these main concepts were either proposed or shown to impact on network performance seen from all three lenses. We thus put forward:

Proposition 3: *Network processes are, all else being equal, main determinants of network performance*

Network structural characteristics and network processes are interrelated (Turrini et al., 2010), this can also be seen from the discussion above. Logically actor strategies such as buffering network instability can result in network stability. Integration through common information and communication systems can foster information sharing. The exact structure of the network can influence information sharing (e.g. brokerage or closure). Between the main concepts in these categories there are recursive relationships, hence we formulate these propositions:

Proposition 4: *Network structural characteristics are, all else being equal, main determinants of network processes*

Proposition 5: *Network processes are, all else being equal, main determinants of network structural characteristics*

2.7.3 Network Contextual Characteristics

Network contextual characteristics form a category for concepts that deal with the environment of the business network. It consists of the main concepts system stability and resource munificence.

A resource-rich environment was found to reinforce the relations between centralized integration and direct non-fragmented external control on network effectiveness in health care delivery (Provan and Milward, 1995). In Guimaraes et al. (2002) it was shown that a high industry clockspeed significantly inhibits the relationship between the depth of

supplier relations (i.e. network stability) and network performance. The intuition behind it, is that the flexibility to quickly change network partners may be more valuable than in-depth close relationships in volatile environments. Industry clockspeed implies the velocity of change in the external business environment in terms of product development and product life cycles. We use definitions by Provan and Milward (1995) and Turrini et al. (2010) of system stability as the rate of change in the external business network environment. System stability also influenced the relation between network processes and network performance. Ye and Farley (2006) found that volatile market conditions strengthened the negative effects of autonomy of firms to set production levels on supply network effectiveness. Based on the above we develop the following two propositions:

Proposition 6: *All else being equal, network contextual characteristics moderate the relation between network structural characteristics and network performance*

Proposition 7: *All else being equal, network contextual characteristics moderate the relation between network processes and network performance*

Given the findings that combinations of network processes and structural characteristics were major determinants of network performance and that network contextual characteristics are a moderating influence there, it is likely that multiple configurations of characteristics can promote network performance. On organizational level, contingency theory has established that contrary to classic organizational theories there are no universal principles for designing an organization, the right design depends on the demands and constraints posed by the internal and external environment (Burns and Stalker, 1961; Lawrence and Lorsch, 1967). Later configurational theorists drew the focus on the interplay of organizational and environmental components and equifinality of designs (see Meyer et al., 1993).

The findings here suggest that for networks a configurational approach would be appropriate as well. In other words, different configurations of networks can perform well. Specific combinations of a type of governance (network process) and size and network stability and integration (network structural characteristics) in the form of trust, goal

consensus and nature of interdependence, can improve network effectiveness as Provan and Kenis (2008) describe while yet other combinations would be detrimental to network effectiveness. With participant-governed networks for example, key network-level activities and decisions are coordinated through all or a subset of organizations in the network. This form of governance is effective when the network is relatively small, when there are high levels of trust and goal consensus among organizations and when interdependent task requirements are low. Without these conditions, this participant form of network governance is likely to fail since there would be little to provide as a basis for collaboration among the organizations; and as a result probably inefficient and inadequate coordination of the network as a whole. Another example that Provan and Milward (2005 p. 27) found in their seminal study, is that resource munificence does not automatically improve network effectiveness. It is conditional upon the integration (network structural characteristic) and system stability (network contextual characteristic) of the network. As Wiewel and Hunter (1985) find for organizations, Provan and Milward conclude that network and system level characteristics are critical for overcoming inadequate funding or for making the best use of resource munificence. This implies that different configurations of network functioning, structural and contextual characteristics can lead to adequate network performance rather than one-size fits all. Raab et al. (2013) are among the first to demonstrate that a configurational approach is beneficial to the understanding of the performance of interorganizational networks. Based on this we propose:

Proposition 8: *Understanding and influencing the performance of interorganizational networks requires a configurational as opposed to a universal approach.*

2.7.4 Network Information Architecture

In order to understand processes and behavior that take place within business networks, we further analyzed the network processes: information sharing, knowledge sharing, network governance and actor strategies. This resulted in three findings. First, by studying the descriptions of these concepts in the selected literature, we found that information precedes and influences these processes.

Information is defined as data that have been shaped into a form that is meaningful and useful to human beings (Laudon and Laudon, 2006 p. 13), "this processing of data lends it relevance for a specific purpose or context and thereby makes it meaningful, valuable, useful and relevant" (Rowley, 2007 p. 172). Information affects the nature and the degree to which the identified network processes take place. Second, the types of information found relate to different levels of analysis: *actor*, *dyadic* and *network*. Third, the network processes in return influence the information available in the network.

Before discussing these findings, we will, based on the theory development in markets by Koppius (2002 p. 5), introduce the term: network information architecture. We define network information architecture as:

Definition 6: network information architecture is *the overall level of actor, dyadic and network information that is available to and relevant for the decision making processes and actions of organizations in a business network.*

The concept is sufficiently broad since it accommodates both information that characterizes the network as a whole as well as information that is specific to a particular organization (including the own organization) or relationship in the network. We will now elaborate on the findings that lead into the concept and its three levels. What will be also be seen is that the network processes are connected to each other and to the network information architecture.

Three Levels of Network Information Architecture

Similar to performance, information can also be classified on different levels in a business network i.e. information involve actors, dyads and the network. To be clear, the level implies the object of information and not for whom or what the information is relevant to, this will be discussed further on. Information on the three levels has been studied before in relation to processes in interorganizational networks and supply chains/networks either

explicitly or implicitly. Table 2.7 lists the informational elements these studies focused on per level and what concept or terminology was used to describe the elements[31].

Table 2.7 Network information architecture

Network information architecture	Informational element	References	Key concept / term
Actor	Product	Moldoveanu et al. (2003a p. 230)	Information distribution
	Reliability and capability as a partner	Gulati (1995 p. 622)	Conduits of information
		Uzzi (1997 p. 48)	Third-party referrals
	Inventory	Cachon and Fisher (2000 p. 1035)	Information policies
	Demand	Forrester (1961 p. 63)	Information distortion
		Lee et al. (1997 p. 546)	
	Cost	Corbett et al. (2004 p. 550)	Information asymmetry
	Competitive intent, strategies, and resources	Gnyawali and Madhavan (2000 p. 432)	Information flows
	Various (e.g. strategy, profit margin, product)	Uzzi (1997 p. 45)	Fine-grained information transfer
	Various (strategic, tactical and operational information)	Patnayakuni et al. (2006 p. 27)	Information flow integration
	Various (order, inventory, transportation, location of product)	Gunasekaran and Ngai (2004 p. 584)	Supply chain transparency
	Various (inventory, process, product)	Barrat and Oke (2007 p. 1220)	Supply chain visibility
Dyadic	Presence of a relation	Gimeno (2004)	Not termed
Network	(Part of) network structure	Van Liere (2007 p. 51)	Network horizon
		Anderson et al. (1994 p. 4)	
		Fawcett and Magnan (2002 p. 355)	Supply chain visibility
		Rowley and Baum (2008 p. 647)	Network awareness
	(Part of) the network structure and (end) customer specifications)	Storer et al. (2003 p. 455)	Customer horizon
	(Part of) the network (e.g. new processes, technologies, solutions, opportunities)	McEvily and Zaheer (1999 p. 1135)	Information
	End customer preferences	Subramani (2004 p. 51)	Information

Actor information

We found information on (a) specific organization(s) to be relevant to network processes. Core agency influence in the Provan and Milward (2005) study and information sharing

[31] To distinguish between the network performance studies from 2.5 and other literature on chains and networks that studied information, we will use phrases such as in the Provan and Milward study.

between vendor and buyers in the Straub et al. (2004) study, both deal with actor information. Actor information is atomistic, it involves information on the behavior and performance of specific organizations. It can include information such as their strategies, resources, capabilities, reliability as a network partner (Gulati, 1995; Uzzi, 1997; Gnyawali and Madhavan, 2000), but also demand, inventory and cost information (Forrester, 1961; Lee et al., 1997; Corbett et al., 2004). This actor level information has been described in the literature under the terms information distribution (Moldoveanu et al., 2003a), information flow integration (Patnayakuni et al., 2006), supply chain transparency (e.g. Gunasekaran and Ngai, 2004) and supply chain visibility (e.g. Barrat and Oke, 2007). The last three concepts specifically entail how buyers and suppliers (and the overall supply chain) benefit from having access to more information on each other's strategic, tactical and operational activities.

Dyadic information

Information that relates to specific dyads in the business network between organizations in the network was also needed to trigger network processes. Reputational control in the Kenis and Provan (2006) study is a mechanism that operates by monitoring relational patterns which hold information about the reputation of organizations in the network. It means that organizations that do not contribute to the objective of the network will gain a low reputation and become peripheral to the network and eventually isolated (ibid.). For this to happen, information on such non-conforming organizations needs to become available (actor information) but also information on the performance of relations with these organizations and relations that have (recently) been discontinued (dyadic information). For the management strategies examined in the Allesina et al. (2010) study such as reducing the number of raw materials suppliers, information is required about the relations between a focal firm and its suppliers and the performance of these relations, in order to decide on which ties to disband. These studies link to information on dyadic level. Dyadic information is at the basis of the mechanisms that Gimeno (2004) describes in his airline study on the formation of alliances as a response to competitor's alliances. He distinguishes between alliances that do include relation specific investments and sensitive

knowledge sharing (i.e. co-specialized) and those that do not (i.e. non-specialized). He found that the likelihood of alliance formation between a firm and its rivals' partners is lower when the rivals' alliances are co-specialized rather than non-specialized; and that co-specialized alliances between two firms respective rivals increase the firms' likelihood of forming a countervailing co-specialized rather than a non-specialized alliance. Such competitive responses require information on the existence and type of relations between firms. Dyadic information also underlies Podolny's (2001) argument of networks as prisms, when faced with uncertainty (or lack of direct actor information) firms can surmise the quality and potential attractiveness of other firms as a partner from their current ties (Podolny, 2001 p. 34).

Network information

Lastly, it was found that the information that relates to specific parts of or the entire business network and its environment was required for network processes. This can be information pertaining the whole or parts of the business network. For instance, the mode of output control from the Kenis and Provan (2006) study requires information on network-level outputs (as well as actor information) to hold organizations accountable for their part in this network performance. The Schumaker (2002) study found that clarity on the goals and objectives on network level as a part of connectivity drives the performance of health care delivery networks. This requires the availability of information on the network's goals and objectives to all organizations. The management strategies discussed in the Allesina et al. (2010) study related to disintermediation or removing redundant connections, the necessary input is information on the network structure or part of it. For adjusting production levels firms used information on the demand of end customers (Ye and Farley, 2006). These studies relate to information on network level.

Business networks add a structural dimension to the information, that is unique to the network level of analysis. Rowley and Baum (2008) discuss how firms may be aware of their position in the partial or overall network structure and the positions of other firms. The term they use is network awareness. Information on network structure has also been termed in the literature as network or customer horizon (Anderson et al., 1994; Holmen

and Pedersen, 2003; Van Liere, 2007) and also as part of supply chain visibility with the mantra of managing the supply chain from "the suppliers' of your supplier to the customers of your customers' customer" (Fawcett and Magnan, 2002).

Information on the actor, dyadic and network level are distinct in the sense that each level offers different information. However, in reality the combination of information on these levels are often useful for decision making and action. For instance, what is information on network structure if it is not accompanied by information on the actors within this structure? Both actor and network information is studied in the food chain study by Storer et al. (2003). These authors looked at how many customers and stages of customers a firm such as a meat processor can identify including the customers' requirements such as quality specifications. This customer horizon was indicative of ongoing problem-solving processes and resulting customer satisfaction and responsiveness to changing consumer demands (i.e. a customer orientation). Gimeno's airline study (2004) combines dyadic and actor information. His findings imply that being aware of the type of pre-existing alliance between a potential partner and a rival (co-specialized or non-specialized), led firms to favor forming one or the other type of alliance themselves with this partner because of the risks involved.

Network Information Architecture and Network Processes

The processes identified before depend on information. This means that the information or information flows among the organizations in the network are required in order for the process to have a causal effect on the performance of the network, and that information forms the process and therefore the impact on performance. We will argue that information precedes the processes of information and knowledge sharing, network governance and actor strategies in networks and also how information affects the nature and degree of the process. As such, the network information architecture will have an indirect impact on network structural characteristics by feeding the network processes. However, we will also discuss how the network information architecture directly affects network stability (a network structural characteristic), and finally, how the network processes also affect the

network information architecture in return. The resulting framework is presented in Figure 2.5, the related propositions 9 to 11 will be developed in the following sections.

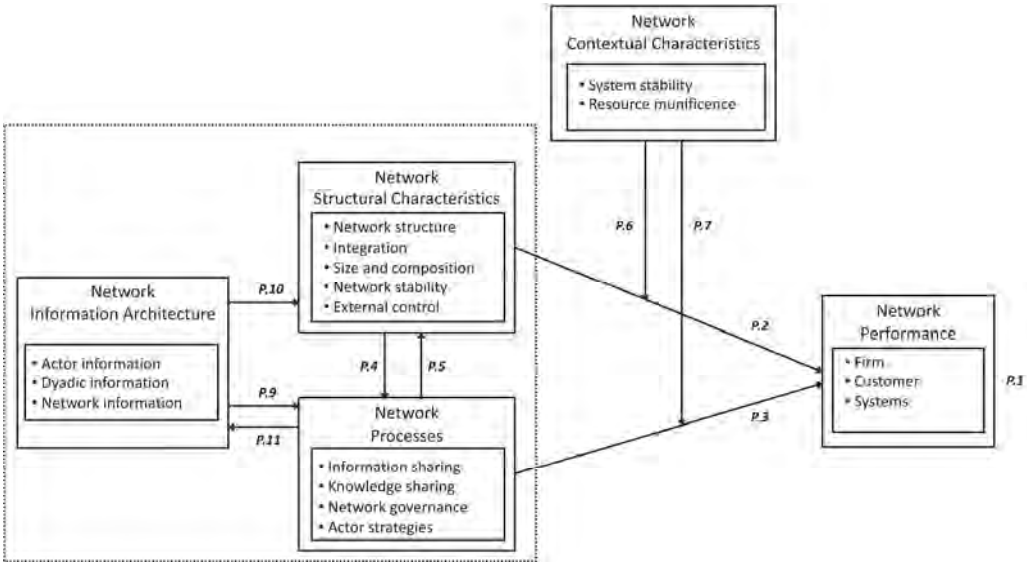


Figure 2.5 Preliminary integrated framework of network performance II

Table 2.8 lists selected network performance studies, network processes, element of information involved and levels. In column three of the table all three levels were mentioned if information on all of these levels directed the network processes.

Information sharing

The argument for information sharing seems the most straightforward one to make. First, in order for information to be shared among organizations in the network, it needs to first be available to the organizations themselves. Second, information on information needs of organizations can also affect information sharing processes within the network.

The Nishiguchi and Beaudet (1998) study describes the aftermath of a fire at an Aisin Seiki plant, the sole supplier of Toyota for P valves and the set-up of alternative production sites by other suppliers. Information related to product designs, process instructions and

technical solutions became available to the firms and then was shared with the other firms in the network and used at the alternative sites to recover production levels. For instance, Aisin used different equipment than machining centers, but Denso quickly solved problems during volume production and disseminated these solutions to other participating firms during problem-solving meetings. Based on the information that Denso acquired it also adapted Aisin's design drawings and process instructions for production by machining centers which Aisin passed on to other firms. Not all suppliers in the Toyota network volunteered as an alternative producer which means being informed on who is participating in the recovery effort and their information needs, also affected the information sharing processes that took place during the Aisin Seiki crisis.

The Straub et al. (2004) study identifies that the degree and symmetry of information sharing between a logistics vendor and its clients advance network performance. The gains these authors find, such as increased productivity and improved production planning and resource control are realized because of the magnitude and overlap in the information that a vendor and its clients disclose to each other such as their own marketing strategies, inventory/capacity planning and production schedules. Informing a partner on marketing strategies or promotional efforts of which the effects will be relevant for the partner's operations, is meeting this partner's information needs. Other factors play a role as well such as willingness to share information (Fawcett et al., 2007) and information strategies (Moldoveanu et al., 2003a) as will be discussed at actor strategies but also awareness of other organizations' information needs influence the sharing processes. To conclude, the network information architecture influences the degree and nature to which the process of information sharing takes place.

Table 2.8 Network processes and information levels

Network processes	Element of information required for network process	Level
Information sharing		
Nishiguchi and Beaudet (1998)	Information and information needs related to product design, process instructions and technical solutions	Actor
Dyer and Nobeoka (2000)	Information and information needs related to improving cost, quality, safety and to general affairs	Actor Network

Guimaraes, Cook and Natarajan (2002)	Purchasing, engineering, product quality, production control, transportation, payment information[32] and information needs	Actor
Straub, Rai and Klein (2004)	Information and information needs on cost and margin structures, production schedules and marketing strategies	Actor
Bodnár, Dankó, Drótos, Kiss and Révész (2006) Degree of work coordination	Shared databases of patients' medical information and information needs	Network
Ye and Farley (2006)	Demand information and information needs	Actor Network
Knowledge sharing		
Nishiguchi and Beaudet (1998)	Information related to knowledge on product designs, process instructions and technical solutions	Actor
Dyer and Nobeoka (2000)	Information related to knowledge on improving cost, quality, safety and on general affairs	Actor Network
Network governance		
Schumaker (2002) Connectivity	Information on goals and objectives of the network	Network
Provan and Milward (2005) Concentration of Influence	Information on influential organizations' needs, goals, decisions and/or expectations	Actor
Kenis and Provan (2006) Control mode (personal centralized, formal bureaucratic, output, cultural or clan and reputational control)	Information on actors and network performance (in order for the control mechanisms to function)	Actor Dyadic Network
Provan and Kenis (2008) Network governance mode (participant, lead-organization and network administrative organization governance)	Information on actors , dyads and the network to govern the network	Actor Dyadic Network
Lindencrona, Ekblad and Axelsson (2009) Mode of interaction (network steering group)	Information that facilitates steering and administration of the network	Actor Dyadic Network
(multi-organizational teams)	Information related to service provision and problem solving	Actor Dyadic Network

[32] While the survey items discuss "data" (Guimaraes et al., 2002 p. 642) it is assumed that when it is exchanged between buyers and suppliers it has been processed so that is meaningful to the recipient.

Actor strategies		
Ye and Farley (2006) Network homogeneity	Information on demand for adjusting production levels[33]	Actor Network
Allesina, Azzi, Battini and Regattieri (2010) Management strategies	Information on actors, dyads and network structure for disintermediation of shipping companies, cutting redundant connections and reducing the number of raw materials suppliers	Actor Dyadic Network

Knowledge sharing

Information precedes and shapes knowledge sharing processes as well. Knowledge is defined as "data and/or information that have been organized and processed to convey understanding, experience, accumulated learning and expertise as they apply to a current problem or activity" (Turban, 2005). When individuals interpret, give context to and anchor information in their beliefs and commitments, information becomes knowledge (Nonaka et al., 2000 p. 7). The data–information–knowledge–wisdom (DIKW) hierarchy) described by Rowley (2007) also implies that information is required to form knowledge. For an in-depth discussion on the nature knowledge we refer to the seminal work of Nonaka and Takeuchi (1995), its critiques and reexaminations. The point made here is that information can be a precursor to knowledge and influence on knowledge sharing in several ways.

The Dyer and Nobeoka (2000) study describes the knowledge sharing routines of the Toyota network among which the supplier association (kyokhai) and its topic committees on cost, quality, safety and general affairs. The quality committee selected the topic "eliminating supplier design defects" and meets several times a year to share knowledge on this matter. What led firms to select this topic over others can only be information available at the firms participating, on the prevalence of design defects and its detrimental consequences for production and product performance. The identification of needs for knowledge creation and the knowledge sharing that follows within business networks have to originate from information. In addition, knowledge sharing will take place when organizations are aware of which other organizations in the network have the knowledge

[33] In the simulation production levels are adjusted by agents based on either their information on their own demand, own demand and immediate customer demand and own, immediate and end customer demand (Ye and Farley, 2006).

that they seek. "Knowing who knows what" is part of the transactive memory literature (Wegner, 1985; Liang et al., 1995). Transactive memory systems or knowledge of who knows what has been shown to facilitate knowledge transfer within organizations (Argote et al., 2003; Borgatti and Cross, 2003[34]). In the Dyer and Nobeoka (2000 p. 367) study an executive stated: "We heard that Tower had one of the best kanban systems so we asked them if we could visit and see what they do. We had a very productive visit and they are coming to visit us as well." The decision to seek knowledge from another organization in the network is informed by the awareness of the expertise and skills within this organization.

In sum, the network information architecture affects the degree and nature to which the process of knowledge sharing takes place.

Network governance

Information also directs processes of network governance. The Provan and Kenis study (2008 p. 231) describe network governance as: "use of institutions and structures of authority and collaboration to allocate resources and to coordinate and control joint action across the network as a whole." These authors identified three modes of network governance: shared participant, lead organization and network administrative organization governance. Li & Fung is an example of a network administrative organization, also called network orchestrator or mini-maestro. "Li & Fung's only product is process" (Brown et al., 2002) and focuses exclusively on coordinating a global network of suppliers without owning factories or taking part in the production process of garments for private label customers in North-America and Europe. Coordination requires timely and extensive information on the network operations of fabric warehouses, garment makers, factory owners and other partners. For example, Li & Fung has a highly granular up-to-date view of supplier performance and benchmarking systems for informing work allocation decisions and for the feedback mechanisms used to maintain quality among its suppliers (Bitran et al., 2007). Moreover, Li & Fung has the ability to divert (stages of) production

[34] Although the authors mention information seeking, in fact they discuss accessing other people's expertise and thinking i.e. knowledge.

and assembly to other regions in response to crises such as shifting trade regulations and currency devaluations (Tang, 2006; Fung et al., 2008). This requires a broad, flexible and global network but also sufficient information on partners' resources, capabilities, performance, availability and country-of-origin regulations and conditions. In sum, information is a key factor for taking responsibility of the whole network.

Apple, Dell, RyanAir, Nike and Toyota are examples of networks that are governed by a lead organization that is a network member[35]. The role of lead organization and associated power is derived from their control of resources related to activities such as product design, product development, marketing and end-customer relationship management. Such orchestrators have to bring together the activities of network partners and link these to their own operations in an effective manner (Hinterhuber, 2002). For example, Dell's model of direct sales and build-to-order production of personal computers and related products and services, combines in-house final assembly with heavy reliance on a global network of contract manufacturers and component suppliers (Kraemer and Dedrick, 2002). The company monitors production operations, inventory per product component, customer demand, trends and problems. Dell uses this information to forecast demand, balance inventory between customers and suppliers, identify problematic suppliers and third-party maintainers, train service representatives and develop problem solutions (Kraemer et al., 2000). Lead organizations rely heavily on information as well for governing the network.

Shared participant governance in business networks as we defined (see end of section 2.2), is more common in health and human services. Such networks rely on the involvement of all or a significant subset of organizations in the network (Provan and Kenis, 2008). Cristofoli et al. (2013) studied shared governance in public homecare where the networks consist of municipalities and the Cantonal government, so called "Spitex organizations" and private and non-profit organizations for the provision of complementary services. Spitex organizations are jointly set up by municipalities and provide some services themselves and activate ancillary and complementary services of other organizations (e.g.

[35] One could argue when these lead firms rely on turn-key suppliers the mode of governance shift somewhat towards the shared participant mode (see Figure 1 Gereffi, 2005 p. 89) because such suppliers provide a full range of services without much direction from the lead firm (Sturgeon, 2001; 2002). E.g. Celestica operates global manufacturing and design facilities to provide printed circuit board assemblies for Dell (Celestica, November 2013). The point made here is that information is required for all modes of governance.

transportation of disabled clients, meal services, oncological care and psychological support). The networks studied describe the role of a Spitex director as facilitator, mediator and leader, for example by resolving conflicts among network partners, formulating network strategy (which needs to be approved by directors of partner organizations and an executive committee), planning network activities, allocating resources and mobilizing network partners. This role draws on information on the services rendered in network, resulting client satisfaction and collaboration/conflict between network partners.

In the Provan and Milward (2005) study, concentration of influence in mental health networks is studied by assessing which organizations are taken into account by other organizations in the network when making key decisions. Current information on the core agencies' needs, goals, decisions and/or expectations is required for influence to operate. Another part of governance is the control mode from the Provan and Kenis (2006) study. For each of the modes discussed (e.g. reputational, cultural, output) there is information required for this type of control to be executed and for network members to be held accountable. Mechanisms of output control for instance, requires monitoring and evaluating organizations' contribution to network-level outputs which are then compared to pre-specified objectives whereas mechanisms of cultural control require monitoring and evaluating organizations' values, beliefs and attitudes.

To conclude, the network information architecture influences how the process of network governance takes place.

Actor strategies

Strategizing in general has been discussed in relation to the information that firms acquire about their environment and partners in the literature streams on environmental scanning (e.g. Hambrick, 1982; Daft et al., 1988; Babbar and Rai, 1993; Yasai-Ardekani and Nystrom, 1996) and supply chain integration, transparency and visibility (e.g. Lee, 1997; Patnayakuni et al., 2006; Barrat and Oke, 2007). For implementing actor strategies such as disintermediation of shipping companies and reducing the number of raw material suppliers described in the Allesina et al. (2010) study, information is needed on structure of network and the performance and capabilities of suppliers. For adjusting production

levels in the Ye and Farley (2006) simulation study, the companies used either local, regional or global demand information with diverging production strategies and implications for network performance. To sum up, the network information architecture influences and adjusts the actor strategies followed by organizations in a business network.

Based on the discussion above on how information influences the behavior of participants and gives shape to the network processes in terms of information and knowledge sharing, network governance and actor strategies, we propose:

Proposition 9: *Network information architecture is, all else being equal, a main determinant of network processes*

Network Information Architecture and Network Stability

Through the conceptual links we have developed so far, network information architecture will have an indirect impact on network structural characteristics by feeding the network processes discussed above. For example, if actor information comes across Toyota that a supplier is free riding or misusing the knowledge sharing network then as part of the network governance, Toyota would decide to exclude the supplier for the network, affecting size and composition and also network structure (Dyer and Nobeoka, 2000).

However, for network stability, a network structural characteristic, there is also a direct relation between this characteristic and network information architecture through the information on network processes. Table 2.9 displays which information on network processes affects the element of network stability in the network performance studies.

Table 2.9 Network stability and information levels

Network stability	Element of information directly affecting network stability	Level
Nishiguchi and Beaudet (1998)		
Group norms (agreements and understanding among group members regarding technology, management, information and knowledge sharing)	Information on past behavior of other firms in the network during problem solving routines (actor strategies, information sharing)	Actor Network
Trust (e.g. assuming fair compensation occur and that other firms will not take advantage of the situation and obtain proprietary information or new contracts)	Information on past behavior of Toyota and other firms and network governance by Toyota (actor strategies, network governance)	Actor Network
Dyer and Nobeoka (2000)		
Network identity (a sense of shared purpose with the collective)	Information on the value of being part of the knowledge sharing network, on the adherence to the goals and values of the network by all other firms, on the interaction with other firms in the network and resulting common language and frameworks of action (information sharing, knowledge sharing, actor strategies, network governance)	Network
Guimaraes, Cook and Natarajan (2002)		
Supplier relations depth (e.g. mutual commitment and understanding, similarity in pattern of shared values, willingness to participate)	Information on the relation between focal firm and suppliers through articulation of attitudes and past behavior on commitment to continue, matching values and beliefs and level of participation in the relation (actor strategies)	Dyadic
Schumaker (2002)		
Connectivity (compatible culture)	Information alignment of values and assumptions between all organizations in the network (actor strategies)	Network
Bodnár, Dankó, Drótos, Kiss, Molnár and Révész (2006)		
Degree of domain consensus (agreement on the appropriate role and scope of each agency, symbiotic or competitive cooperation)	Information on the scope of activities of all other organizations in the network and their objectives (actor strategies)	Network
Degree of ideological consensus (agreement on the nature of the tasks faced, shared assumptions and values)	Information of the values and assumptions of all other organizations in the network concerning the professional knowledge needed for service provision (actor strategies)	Network
Degree of trust (positive evaluation of other organizations)	Information on all other organizations' past behavior and the resolution of conflict of interest (actor strategies, network governance)	Actor
Degree of work coordination (alignment of work patterns and culture)	Information on ways of working of other organizations and individuals and their goals (actor strategies)	Actor

Clarke (2006)		
Affective commitment (emotional attachment to the network, e.g. belief that collaboration in this network will improves outcome for service users)	Information on contribution of the own organization and the network to service provision for clients and local community (actor strategies, network governance)[36]	Actor Network
Zelbst, Green, Sower and Reyes (2009)		
Risk reduction (e.g. buyers and suppliers reduce the uncertainty a firm faces)	Information on resources and capabilities of suppliers and the business of buyers and their strategic decision-making (actor strategies)[37]	Actor
Moeller (2010)		
Network commitment (e.g. network evolution is pivotal for long-term evolution of each partner, strategies are aligned to the business network)	Information on the past actions and adjustments of strategies and behavior of firms to the network (actor strategies)	Network

Network stability contains elements of trust, shared norms and values, commitment and network identity.

The studies by Nishiguchi and Beaudet (1998) and Bodnár et al. (2006) emphasize perceived benevolence and integrity which are factors of trust (Mayer et al., 1995). Here it would imply the extent to which organizations are perceived to want to do good to the other organizations in the network, aside from an egocentric profit motive and the adherence of organizations to a set of principles and the acceptability of the principles to other organizations in the network (Mayer et al., 1995). The development of trust depends on the opportunities that organizations have to gather information about the benevolence and integrity of other organizations (Doney and Cannon, 1997; Mayer et al., 2007). This is information on past behavior and promises reflected by the actor strategies and network governance by Toyota which could have been gained from observation and direct experience or from third-party sources in the network. The actor strategies and network governance involved a positive orientation towards organizations in the network and involve actions that were not at the sole expense of other organizations in the network. That is why "trust was manifested throughout the recovery effort, as firms simply assumed that compensation for their efforts would be forthcoming and fair and that other firms

[36] This refers to information on network performance and a feedback loop between network performance and network information architecture, but also information on the combination of actor strategies in the network.

[37] This refers to market characteristics (switching costs, risks replaceability) (De Ruyter et al., 2001) but also to information on strategies of partners in the network.

would not take advantage of the situation to steal proprietary secrets or new contracts" (Nishiguchi and Beaudet, 1998 p. 57). Bodnár et al. (2006) discuss how levels of trust impact cooperation and the performance of Hungarian health networks. Trust among network members can be eroded by any legitimized cheating that occurs with health funding and if conflicts between agencies are unresolved. The perceptions of integrity of network members that are implied here, will be shaped by information on past conduct of other organizations and how the network is governed.

Benevolent intentions can be inferred from the development of shared values and norms between organizations that enable organizations to better understand what drives the behavior of other organizations (Macneil, 1980; Doney and Cannon, 1997). Shared values have been linked to trust and commitment and is defined as "the extent to which partners have beliefs in common about what behaviors, goals, and policies are important or unimportant, appropriate or inappropriate, and right or wrong (Morgan and Hunt, 1994 p. 25). Norms are the rules by which values are operationalized (Wilson, 1995), in the current context they would be defined as expectations about behavior that are at least partially shared by a group of organizations in the network (Moch and Seashore 1981; Heide and John, 1992). A shared value in the Nishiguchi and Beaudet study (1998) would be continuous improvement and a shared norm or "common code" would be that information and knowledge sharing in the network is reciprocal. The degree of shared expectations about behavior will be influenced by what organizations perceive about each others' practices.

Trust has been linked to commitment which in the context of a business network entails that organizations believe that an ongoing membership within the network and relations with other organizations are so important, as to warrant maximum efforts at maintaining these (Moorman et al., 1992; Morgan and Hunt, 1994). Commitment can be separated into affective and calculative commitment, the former involves sharing, identifying with, or internalizing the values of the network and the latter involves a cognitive evaluation of the instrumental worth of a continued membership and participation in the network by adding up the gains and losses, pluses and minuses, or rewards and punishments (Morgan and Hunt, 1994, De Ruyter et al., 2001). The Clarke (2006) study found a positive influence of

affective commitment on the performance of a network of drug misuse or prevention service delivery. Affective commitment is measured through items on emotional attachment to the network and a belief that collaboration in this network will improve services for users. Affective commitment was increased by mutual interdependence, mutual gain, effective conflict resolution and role clarity. Assessing whether participating in the network brings benefits to all network members or whether objectives cannot be achieved without involvement of the other organizations (mutual gain, interdependence), requires information on the strategies pursued by all organizations in the network. Similarly, whether organizations work hard to resolve conflict and whether organizations are aware of each individual organization's roles and responsibilities in the network, are assessments based on information on how the network is governed. The Moeller (2010) study includes a survey among various business networks in Germany and the results positively link calculative commitment to network performance. Commitment is measured by assessing whether each partner's strategies is aligned to the business network and whether each partner's processes has been adjusted to the network's specialties. This implies that the information on strategies of the other organizations shapes the level of commitment in the network.

Network identity has been defined as a structural property that emerges from (inter) organizational practices of network members when answering the questions "who we are as a network" (Rometsch and Sydow, 2006 p. 31). Related properties (centrality, distinctiveness and continuity) become institutionalized over time in belief about what the network stands for and manifest themselves in symbols and artifacts. In the Dyer and Nobeoka study (2000) these manifestations are the general assembly, supplier association, consulting/problem solving teams and plant tours and basic quality training that give rise to common language and frameworks of action. The extent of a common orientation across organizational boundaries (Raab and Kenis, 2009) or network identity, will be based on information on network governance by Toyota, information and knowledge sharing in the general assembly, supplier association, consulting/problem solving teams and on the decisions and actions as part of actor strategies of organizations.

The previous discussion has argued how the network information architecture will shape the nature and degree of network stability, summing up we propose:

Proposition 10: *Network information architecture is, all else being equal, a main determinant of network stability*

Network Processes and Network Information Architecture

As was discussed earlier, the network information architecture influences the network processes: information sharing, knowledge sharing, network governance and actor strategies. Information is the needed input for the operation of the mechanisms and forms the processes as well.

Here we will argue that there are also effects going from these processes back to the information architecture of the network. In other words, there is an interrelation between network processes and the network information architecture. Figure 2.6 displays the connections between information and knowledge sharing to network information architecture that will be described in the following.

Information sharing

Information sharing[38] among network partners and via interorganizational systems and standards influence respectively actor information and actor and network information. Studies on interorganizational networks (see Table 2.7) have described how using previous and current partners (Gulati, 1995; Gnyawali and Madhavan, 2000) can increase the actor information available to firms in terms of potential partners, competitors or other firms' competitive intents, strategies, capabilities and resources.

Studies on supply chains have described how the use of interorganizational systems and standards (Gunasekaran and Ngai, 2004; Subramani, 2004) by buyers and suppliers

[38] It is acknowledged that information sharing does not automatically lead to a higher overall level of information that is available and relevant to the organizations in the network. This depends on the quality of the information. Information quality has different dimensions such as timeliness and accuracy (see Zmud, 1978; Lee et al., 2002). However, for purposes of scope we do not focus on the quality of information in this dissertation.

increase actor and network information available to partners in terms of demand, order, inventory, transportation information. In 2005 Wal-Mart required its top 100 suppliers to adopt standards which were radio frequency identification (RFID) tags on their shipments (Fung et al., 2008) because with the increased network information on orders it could improve supply chain management. Moreover, the use of interorganizational systems such as point-of-sale systems also can enhance network information in terms of information available on the environment such as customer preferences, patterns in the sale of complementary products and product-returns (Subramani, 2004).

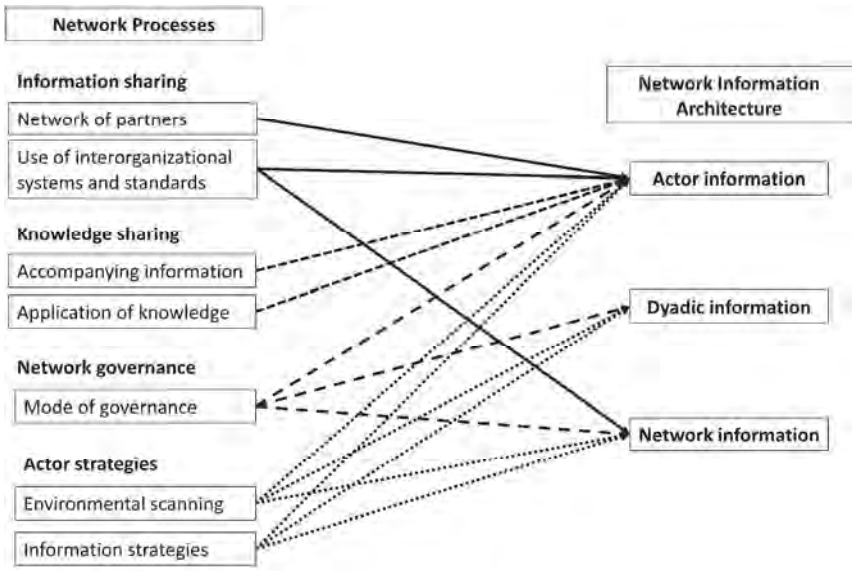


Figure 2.6 Influencing network information architecture

The extent to which the network of partners or interorganizational systems and standards are used for information sharing, will affect the network information architecture. In addition also the information sharing behavior of organizations will provide other organizations with actor information on their openness. Openness involves "honest incentives to share accurate, comprehensive and timely information that bear in mind partner's needs and benefits" (Ibrahim and Ribbers, 2009). This type of actor information will influence future information sharing processes.

Knowledge sharing

Knowledge sharing influences the network information architecture via the actor information related to the knowledge and its sharing, and the actor information resulting from knowledge application. For instance, the supplier association is a knowledge sharing routine of Toyota that aims to promote the exchange of technical information between Toyota and its part suppliers. Moreover, the knowledge sharing behavior itself also reveals information on the other organizations in the network, for instance what they used the knowledge for and how much of their knowledge is made accessible to other organizations. This type of actor information will impact future knowledge sharing processes. Second, the application of knowledge can lead to new actor information such as showcase suppliers that Toyota uses as examples of successfully implemented elements of the Toyota Production System or the identification of new problems and solutions.

Network governance

For network governance, the mode will lead to different network information architectures, so different overall degrees of information on actor, dyadic and network level. For networks where governance is executed by a lead or a network administrative organization, many information flows will go through this central organization for coordination and decision making relative to shared participant governed networks, where this is done by all or several organizations, and where there are relatively more direct organization-to-organization interactions and information flows (Provan and Kenis, 2008). In more centralized, brokered networks the access by other organizations to information on other actors and dyads (partner, competitor and other) and also the network environment (e.g. regulations) will be different than in decentralized networks.

Actor strategies

Actor strategies can influence the network information architecture on all three levels via information that organizations make available about themselves to the other organizations in the network or the information that organizations themselves seek on their environment. Organizations can broadcast information on their products or announce new buyer and

supplier alliances. Moldoveanu et al. (2003a) distinguish between competitive and cooperative information strategies which respectively focus on manipulating the distribution of information within the network through for instance deception, or establishing common understanding about information that is already distributed in a network or parts of it. Studies on environmental scanning describe how organizations allocate resources to gather information of various sectors of their environment such as customer, competition, technological and regulatory (Daft et al., 1988; Choudhury and Sampler, 1997) in order to develop responses to external changes or to improve their position in the future. The sophistication, scope and intensity of environmental scanning are matched to the overall strategy of a business (Hambrick, 1982; Choo, 1999).

This discussion covered how the network processes in turn, impact the network information architecture. Based on these arguments we develop the following proposition:

Proposition 11: *Network processes are, all else being equal, main determinants of network information architecture*

Figure 2.5 (on the next page) which was already shown in section 2.7.4, added propositions 9, 10 and 11 to the framework from Figure 2.4.

With this addition to the framework we will now discuss the interrelations between network information architecture, network processes and network structural characteristics (delineated by a dotted line in Figure 2.5) using the Dyer and Nobeoka (2000) study for the Toyota knowledge sharing networks in Japan and the United States.

The governance of the knowledge sharing network has three structures: supplier association (i.e. forum), consulting division/problem solving teams and voluntary learning teams. In the early stages of network formation Toyota forms bilateral relationships with suppliers and it sets an example for *knowledge sharing* by providing free consultancy to suppliers, making available all of its production know-how offering and deploying supplier association activities. Suppliers start participating in knowledge sharing out of commitment to Toyota but also to receive valuable knowledge transfers.

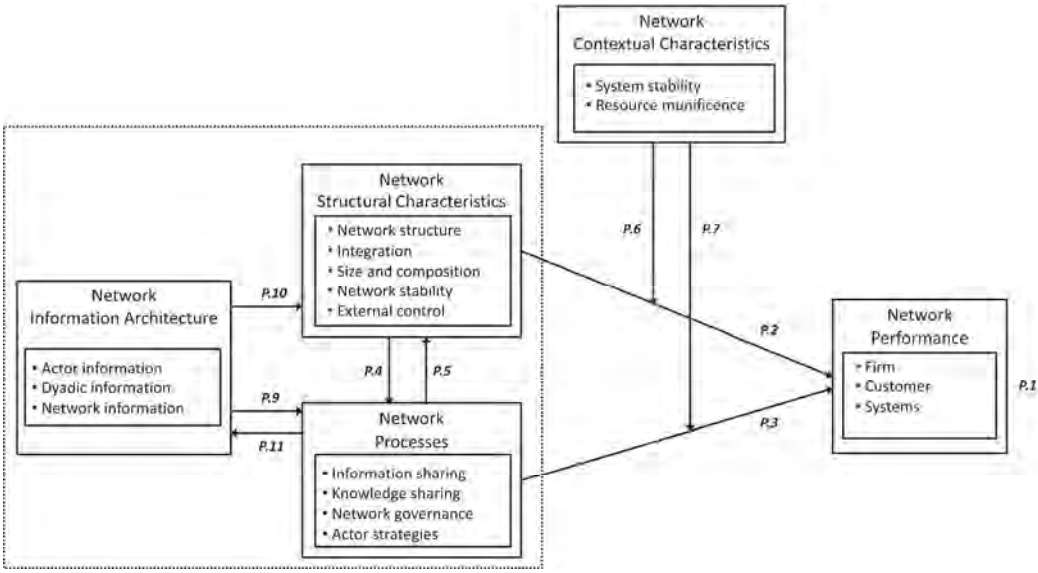


Figure 2.5 Preliminary integrated framework of network performance II

Toyota also has a consulting division that offers direct assistance to suppliers usually in the form of a team of consultants that are present on-site for periods ranging from one to day to many months. Moreover, Toyota has a practice of forming problem-solving teams to address emergent problems within the network and bring knowledge to bear in solving these (ibid p. 355). Being able to compose these teams from Toyota divisions and also suppliers and orchestrating supplier-to-supplier knowledge transfers, implies that Toyota is aware of the expertise that resides within these firms. Toyota monitors the knowledge sharing behavior of suppliers and enforces rules for knowledge protection and value appropriation as part of its *network governance*. With exceptions of direct competitors, production-related knowledge that Toyota or a supplier has is viewed as accessible to virtually any member of the network. Suppliers feel an obligation to Toyota which helps create a strong network identity and norms of reciprocity which is part of *network stability.* Important drivers of interorganizational knowledge transfer identified in a meta-analysis by Van Wijk et al. (2008) were trust and tie-strength. Toyota is able to form a knowledge sharing network characterized by trust and strong ties and identity because the firms know

that Toyota will not directly appropriate the value after each improvement that results from knowledge sharing activities, for example by demanding immediate price cuts (Dyer and Hatch, 2004). The firms in this network will have *actor information* on the ongoing behavior of Toyota and of other firms regarding the rules related to protecting or hiding valuable knowledge and free riding. This continuous actor information reinforces the motivation of members to include knowledge sharing in their *actor strategies* to the high degree that goes on in that network. This builds trust and network identity, which trigger future actor strategies and knowledge sharing processes. At mature stages of network development, Toyota groups suppliers together in voluntary learning teams to assist each other with productivity and quality improvements based on production processes, geographic proximity, competition and experience with Toyota. Direct competitors are kept apart and group membership is rotated for a maximum diversity of ideas in learning teams. This creates multilateral knowledge flows in the network. Firms have to be member of the Toyota supplier association for at least one year in order to be eligible for participation in a learning team. When the voluntary learning teams grows, Toyota reorganizes suppliers based on four skill level groups (Dyer and Nobeoka, 2000 p. 356).

The descriptions on how Toyota facilitates these knowledge sharing processes and institutionalized routines, require that Toyota has access to extensive actor information. The reinforcement of knowledge sharing processes (via actor strategies and supported by network governance and network stability) is predicated on the availability of actor information. Similar to markets and supply chains, networks can fall along a continuum between opaque and transparent based on the information architecture (Lamming et al., 2001). The evolution of the Toyota knowledge sharing network in the United States from initiation to the mature phase required a certain network information architecture and level of transparency without which the knowledge sharing processes and development the network could not have taken place.

2.8 Conclusion

This chapter delivers a conceptualization of network performance and a stepwise development of a preliminary integrated framework that explains network performance. The development in this chapter can be summarized as follows.

First, we have conceptualized network performance by organizing and analyzing the literature in this nascent area of research. The present network performance literature was characterized by both dearth and diversity. A relatively few number of studies on network performance which used different concepts, measures, evaluation perspectives and factors. Network performance is then comprehensively defined through the introduction of the firm, customer and systems lenses which represent different evaluation perspectives.

Second, analysis of the explanatory network performance studies and identified factors, showed that network performance is influenced by the broad categories of network structural characteristics and network processes. Both relations with network performance are moderated by the network contextual characteristics.

Third, further analysis uncovered that what directly or indirectly determines the network processes and structural characteristics, is information on actor, dyadic and network level. This led to the introduction of a new concept termed the network information architecture. Following this, the (inter)relations between network information architecture and network stability (a network structural characteristic) and network processes are discussed. The findings that arise from the analysis of the scarce extant literature on network performance result in a preliminary integrated framework and related propositions. This represents the current state of the knowledge on business network performance. In the remaining chapters in this dissertation, empirical studies will focus on further development and support of the framework. In the next chapter we will take an deductive approach going from the left hand of the framework and study variations in network information architecture. The study involves hypothesis testing of relations between network information architecture and network structural characteristics and network processes and network performance. For purpose of scope we zoom in on network performance through the customer lens.

Chapter 4 takes an inductive approach going from the right hand of the framework. We will look through all three lenses of network performance in a field case and develop propositions for explaining network performance. We aim to strengthen the preliminary framework built in this chapter. Through the case we also aim to validate the conceptualization of network performance developed this chapter by operationalizing and capturing business network performance in the field.

To conclude, in the next empirical chapters the focus will be on validating, supporting and potentially extending the conceptual framework developed in this chapter.

CHAPTER 3 Laboratory Experiments

3.1 Introduction

Here we will validate part of the conceptual framework from Chapter 2 by examining the effects of variations in the network information architecture on network performance through the customer lens (see Figure 3.1). The following sections develop and test hypotheses on the relations between actor, dyadic and structural information transparency on performance through network structural characteristics and network processes. In specific, actor strategies impacting the network structure and composition.

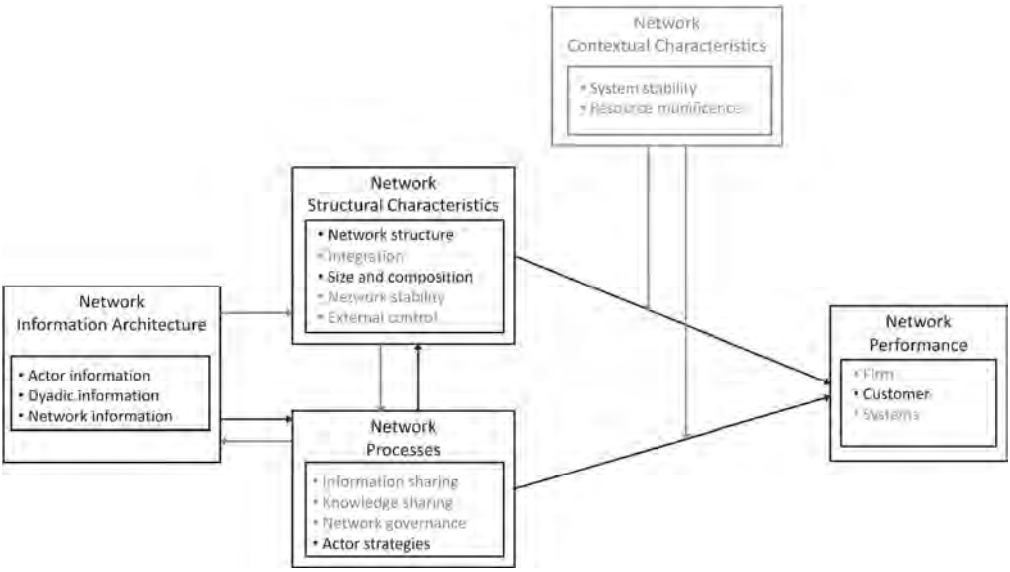


Figure 3.1 Part validation of the integrated framework in this chapter

3.2 Network Performance through the Customer Lens

In this chapter the focus is on network performance through the customer lens. Paraphrasing Simon (1976), Kenis and Provan (2009) discussed that the selection of assessment criteria (here the three lenses from Chapter 2) is by nature, a normative decision. Evaluators choose to assess network performance from the perspective of certain stakeholders because they deem it more important than others. In Chapter 4 we will adopt all three lenses also known as a "multi-constituency approach" (Provan and Kenis, 2009). Here we favor the customer lens, since interorganizational networks will have to either outperform other networks in the eyes of customers in the private sector or deliver outcomes that are valued by clients or the community in the public sector. From a competition and social welfare point of view we believe that evaluating performance through the customer lens is relatively more important than the other lenses. Therefore in this study aiming to understand the relations between a newly introduced concept, network information architecture and network performance, we chose to adopt this lens. As for performance concepts, efficiency and effectiveness are basic domains of firm performance that have been clearly distinguished in the literature (Barnard, 1968). Similar to organizations, networks can also vary in their efficiency and effectiveness (Jarillo, 1988; Möller and Svahn, 2003) to customers. We thus choose these concepts and define these as:

Definition 7: network effectiveness is *the extent to which the network can meet customer demand for a wide variety of products or services.*

Definition 8: network efficiency is *the extent to which the network can deliver specific products or services at a competitive price for the customer.*

To further clarify, in principle, a network may be highly effective in the sense that it can offer a wide variety of products/services to customers, but very inefficient in the sense that those offerings are not competitively priced. Conversely, a network may be highly ineffective in the sense that it can only offer one or two products/services, yet very efficient in the sense that the limited set of what it can offer is priced very competitively.

3.3 Network Transparency, Actor Strategies and Network Performance

External information is a key input in strategy formulation and decision making (Ansoff, 1979; Pawar and Sharda, 1997). The literature stream on environmental scanning connects strategizing to the information that firms acquire about their environment (e.g. Hambrick, 1982; Daft et al., 1988; Babbar and Rai, 1993; Yasai-Ardekani and Nystrom, 1996).

In business networks, firms have to some extent information on the existence and characteristics of other firms such as competitors, buyers and suppliers which will affect their strategies and decisions. For example information about their prices, resources, capabilities and value and reliability as a potential partner (Van de Ven, 1976, Gulati, 1995; Uzzi, 1997; Makadok and Barney, 2001). This was termed as actor information in Chapter 2 (section 2.7.4).

For strategies regarding their own capabilities, firms in networks can aim for improving operational efficiency, improving the leverage of existing capabilities and developing new capabilities (Loeser, 1999). Firms can also contemplate the make-or-buy decision (Gulati et al., 2000), this is the core strategic issue of determining which activities to carry out in-house and which to channel through business networks (Möller et al., 2005). When deciding to outsource the question rises of whom to identify and select as a network partner (Beckman et al., 2004; Gulati, 1995). Available actor information is therefore important for identifying potential partners, in addition it can also help firms with identifying and responding to potential competitive threats (Peteraf and Bergen, 2003).

Network and dyadic information on linkages between organizations also influences partner selection and tie formation. Firstly, when there is uncertainty (or lack of actor information), the quality and potential attractiveness of firms can be inferred from their connections to other firms (Podolny, 2001). Secondly, when a rivaling firm allies with another rival, it can induce the focal firm to also connect with that ally or to countervail by linking to the ally's rival (Gimeno, 2004). Thirdly, the information on links can also lead firms to circumvent other firms i.e. creating direct ties and cutting out the middleman. These examples involve a combination of information on actors, dyads and structure that influences the strategies of actors in a business network.

Actor strategies including the development new capabilities, partner selection or tie formation will have network level implications in terms of the structure (Gulati et al., 2010) and the composition (Baum et al., 2000) of the network. This is in turn likely to impact the performance of the network. The following sections develop hypotheses on how actor, dyadic and network information transparency impact network efficiency and effectiveness through specific actor strategies: partnering, disintermediation and operational excellence strategies.

3.3.1 Network Transparency and Partnering Strategies

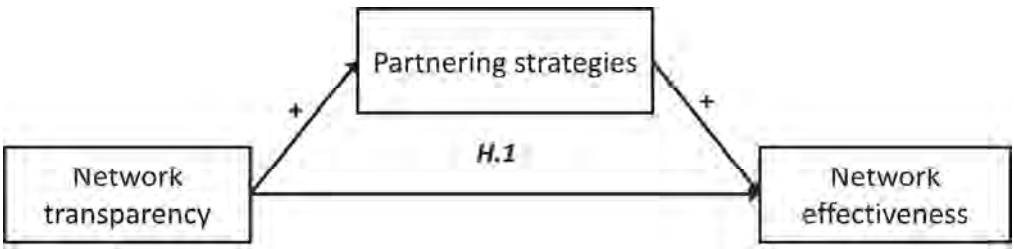


Figure 3.2 Mediation through partnering strategies

Prior research has noted that there is considerable heterogeneity of available actor information on prospective partners across firms (Gulati and Gargiulo, 1999). Firms must first be aware of other firms in order to identify these as potential partners. The level of awareness (amount of actor information) determines the number of potential alternatives considered for partnering and awareness or actor information is therefore a predictor of the formation of ties (Gulati and Gargiulo, 1999; Van de Ven, 1976).

Gimeno (2004) examined the types of alliances formed by firms as a strategic response to the alliances formed by rivals. For example, he found that when rivals formed exclusive or co-specialized alliances with a partner, focal firms were more likely to select countervailing co-specialized alliances with the partner's rival as a response. A prerequisite here is that this dyadic information has come to the attention of the firms

initiating the response. Previous research has demonstrated with experiments that when more firms have information on other firms and the network structure, it intensifies the competition for bridging positions[39]. It means that bridging positions are being turned into closed ones through more connections and a higher density (Van Liere, 2007).

Access to a larger actor, dyadic and structural information set broadens a firm's range of feasible actions[40] such as partnering. Firms that are better informed can keep track of the developments in the business network and assess others' motives and behaviors more accurately and quickly than firms with a more limited information set (Gnyawali and Madhavan, 2001). As discussed above a more transparent network in terms of actor, dyadic and structural information can increase the density of the network through partnering strategies.

Higher density can enhance the ability of the business network to fulfill demand, similar to route selection in communication networks. There are more possible "paths" that can be taken to provide products or services to the end customers. For example, when Airfrance allied with Delta Airlines in 1999 in response to the competitors' alliances such as KLM and Northwest (Gimeno, 2004), customers benefited from more options for transatlantic travel or cargo shipping. Compared to more sparsely connected networks, dense networks can have a better potential to meet customer demand for a wide variety of products or services, thus we hypothesize:

Hypothesis 1: The positive relation between network transparency and network effectiveness is mediated by higher density resulting from partnering strategies by firms in business networks

[39] A firm occupies a bridging position when its partners are not directly connected to each other (Van Liere, 2007) this is the case when there are structural holes between the partner firms (Burt, 1992)

[40] It is acknowledged that this argument has limits due to bounded rationality (Simon, 1979) and conditions related to the information processing by organizations and managers (Daft & Weick, 1984)

3.3.2 Network Transparency and Disintermediation Strategies

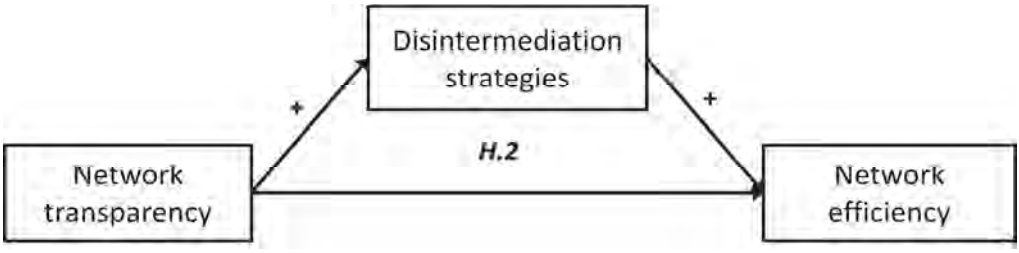


Figure 3.3 Mediation through disintermediation strategies

In industries such as financial services and travel where the Internet has increased the information on prices and services to all market participants, the threat and occurrence of disintermediation of firms has been discussed and observed (Clemons et al., 2002; Tse, 2003). Disintermediation is defined as a situation where direct interaction between buyers and suppliers eliminates the role of a previously essential intermediary firm (Clemons et al., 2002). Through the transparency enabled by the Internet, producers can forge direct links to customers, reduce reliance on intermediaries and cut labor costs (Jallat and Capek, 2001). Studies have described how retailers such as insurance and travel agencies have been bypassed (Clemons and Hitt, 2000; Andal-Acion et al., 2012). Disintermediation can be initiated by suppliers such as when insurance companies start dealing directly with their customers online or by customers such as when stock traders start using online brokerage services instead of traditional brokers (Clemons et al., 2002). It has been shown that transparency reduces intermediation unless either new intermediairies arise or intermediaries reinvent their role by developing new capabilities that add value (Chircu and Kauffman, 2000; Garven, 2002).

So far the move towards shorter value chains has been described in electronic marketplaces (Giaglis et al., 2002) and supply chains (Welty and Becerra-Fernandez, 2001; Spekman et al., 2002). In business networks this disintermediation phenomenon could occur as well, provided that firms have actor information such as prices and capabilities and dyadic and network information such as the connections and location of other firms in the network.

Previous research demonstrated with experiments that under conditions of high transparency in terms of information on other firms, their prices, capabilities and the network structure bridging positions cannot be sustained on the long term (Van Liere, 2007). This is because other firms, for instance those close to either side of the bridge, will connect to the unconnected parts of the network, and by doing so disintermediate the bridging firm. For markets and supply chains disintermediation can lead to a lower cost channel structure resulting from cutting out the "middlemen". For networks, when more actor, dyadic and network information leads firms to rely less on intermediate firms in fulfilling demand, the prices of products and services can also involve fewer costs and margins. Thus we hypothesize:

Hypothesis 2: The positive relation between network transparency and network efficiency is mediated by the shorter chains resulting from disintermediation strategies by firms in business networks.

3.3.3 Network Transparency and Operational Excellence Strategies

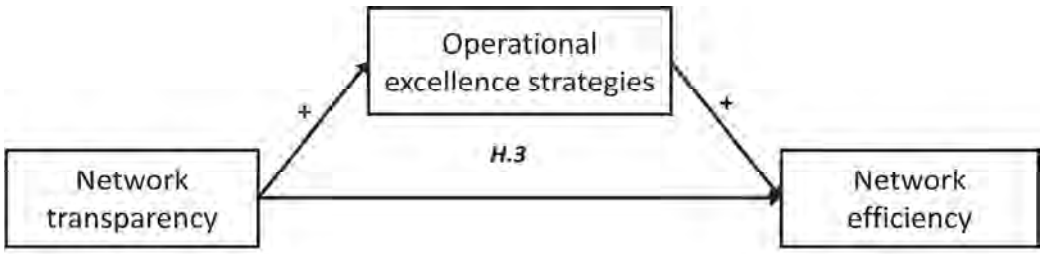


Figure 3.4 Mediation through operational excellence strategies

The transparency of a network can involve different cues or information for decision makers to use (Hartman et al., 1986). Since there is a large theory base on the mechanisms of transparency in markets and supply chains in terms of prices and capabilities, we shall focus on such information here as well. A capability is defined as: "a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a

desired end" (Amit and Schoemaker, 1993 p.35). The development of capabilities often occurs through a combination of physical, human, and technological resources at the corporate level or in functional areas (e.g., brand management in marketing) (ibid.). In business networks multiple firms combine their capabilities to produce and deliver products and services that none of them could more economically produce on their own (Kauffman et al., 2010).

It has been shown that in many market settings, as the cost of acquiring information about price and product offerings decreases, i.e. market increases in transparency, it becomes difficult for sellers to sustain their prices. As a consequence sellers' price premiums and profit margins are reduced (Bakos, 1991). Mathematical models explain that this is because the reduced buyer search costs caused by product and price transparency promote price competition (Bakos, 1997) and allows firms to infer the cost structures of their rivals (Zhu, 2004). The Internet allows such efficient gathering of information about offerings and reduces search costs of both customers and competitors. Various empirical studies have indeed shown that prices on the Internet are lower relative to traditional channels (Brynjolfsson and Smith, 2000; Brown and Goolsbee, 2002; Zettelmeyer et al., 2006). This means that the increased transparency through the Internet challenges the profitability of suppliers. Exceptions where reduced profit margins through higher transparency can be offset are: situations where competitors can tacitly collude (Granados et al., 2010) or where the transparency offered by the marketplace is accompanied by other economic factors such as lower transportation costs or minimizing quality risk for buyers (Lee, 1998). These situations aside, under pressures on their profitability, firms' strategies will focus either on improving their operational effectiveness or on strategic positioning as Porter (2001) described. Strategic positioning refers to offering unique value compared to competitiors (ibid.). Operational effectiveness or excellence as Treacy and Wiersema (1993 p. 84) termed it, refers to "providing reliable products and services at competitive prices and delivered with minimum difficulty or inconvenience." To be able to do this firms will need to focus on lowering their operating costs to realize a cost advantage[41]. Operational excellence will be a widespread consideration among firms in business

[41] This corresponds with the generic strategy of overall cost leadership (Porter, 1980; 1985).

networks with multisourcing, such as those producing computers, flights, clothing and cars. Even if strategic positioning is possible each supplier still has to be able to maintain its relative competitiveness long term, otherwise it risks being replaced with a more efficient one by the lead organization (Möller and Rajala, 2007) or other buying firms. Conditions of high network transparency in a business network expose the prices and minimum cost structures of suppliers in the network and allow buying firms to select and switch to more competitive partners. Under this threat of substitution, firms will to a certain extent feel pressure to focus on operational excellence in their strategies so it changes the composition of the network. When firms focus on operational excellence and lower their operating costs under conditions of price competition, these cost economies will be used to lower the prices of supply within the network. This would lead to more competitively priced products or services delivered by the network. So, we hypothesize:

Hypothesis 3: The positive relation between network transparency and network efficiency is mediated by an increased focus on operational excellence in the strategies of firms in business networks

The hypotheses developed above and related mediational models are shown in Figure 3.5.

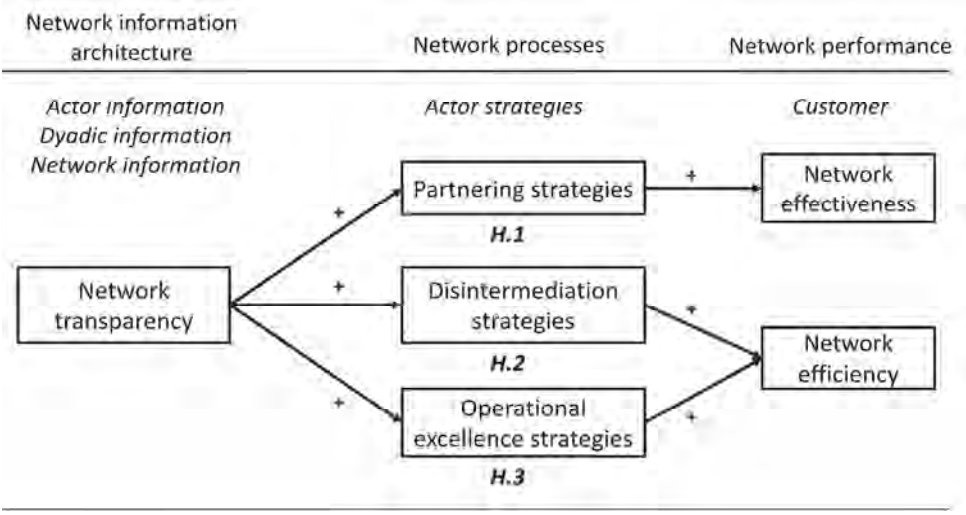


Figure 3.5 Conceptual model

3.4 Methodology

For testing the preceding hypotheses we have run network experiments supported by software. This section describes the experimental setting, procedure, measures and treatments of the laboratory experiments in detail.

3.4.1 Experimental Setting

We have utilized the Business Networking Engine (BNE), a network experiment environment that has been specifically designed to study business network phenomena. BNE can model the operation of business networks in a variety of industries. For this study we have chosen to model the insurance industry and do so for two reasons.

First, the insurance industry is an appropriate context for examining the performance of business networks. The industry has always been characterized by insurance firms' dependence on other firms through their use of intermediaries or brokers. Due to specialization and technological developments the service of insurance has been disaggregating and specialized firms have been taking over functions that were originally performed by vertically integrated insurance firms. Second, a BNE scenario in the insurance industry has been calibrated with empirical data (Van Liere, 2007). Strategy consultants, industry experts and board members of a large Dutch insurance firm provided input for scenario development. After initial development, over 90 senior and middle-level managers and brokers of the insurance company participated in pilot tests and provided feedback for fine-tuning. Results indicated that the scenario is realistic in simulating the insurance industry (products and capabilities), the insurance network structure and different roles needed to sell insurance policies (ibid. p. 76). This calibration ensured a higher degree of external validity than can commonly be expected from experiments.

Within the scenario or experimental setting, participants operate a firm in the insurance industry and compete and collaborate in a management game. A simulated consumer market generates a demand for modularized insurance policies. Each firm has several capabilities that fit one of five initial functions (insurance advice, marketing and sales, customer acceptance, claims settlement and customer service) necessary to fulfill part of an

insurance policy[42] (see Table 3.1). Functions are defined as value added activities undertaken by firms in a business network that require distinct and different technologies (e.g. skills, applied knowledge, equipment) (Kambil and Short, 1994). A customer order for an insurance policy can only be fulfilled if the network can deliver a combination of five required capabilities (each belonging to one of the functions).

Firms in the network fulfill the market need together by bundling their capabilities. This implies that the network of firms combines their efforts to deliver a complete insurance policy to the customer. Firms however do not necessarily keep the same functions over the course of an experiment. Participants can shift the functions of their firms by investing or dismantling capabilities and/or connections with firms in the network.

Table 3.1 Functions, description and capabilities

Functions	*Description*	*Capabilities (1 to 13)**
Insurance advice	These firms are the brokers between customers and insurers. They have direct access to the market and provide customers with insurance advice.	Generic advice (1) Specific advice (2)
Marketing and Sales	These firms are responsible for marketing and sales of insurance policies (product lines bronze, silver and gold differ in their risk coverage).	Product line bronze (3) *Product line silver (4)* *Product line gold (5)*
Customer acceptance**	These firms are the underwriters that assess the eligibility and risk of a customer to receive insurance and determine whether an applicant for a policy is accepted or not (in the experimental setting all applicants are accepted).	Acceptance car policy (6) Acceptance home policy (7) Acceptance travel policy (8)
Claims settlement**	These firms handle the settlement of all damage claims of insured customers and disburse any payments resulting from these.	Settlement car policy (9) Settlement home policy (10) Settlement travel policy (11)
Customer service	These firms run the administrative processes of handling policies and offer customer service through call centers or websites.	Customer care call center (12) Customer care online (13)

* In italics means that companies have to invest to develop this capability during of an experiment, it is not offered by the network at the start of the experiment

** The capabilities for claims settlement and customer acceptance are product-specific, when offered these capabilities need to match for the type of insurance that is demanded (i.e. car, home and travel).

[42] The exception to this is firm Hermes that starts with two functions, insurance advice and marketing.

In Chapter 2 the characteristics of a business network were defined (see section 2.2). Table 3.2 details how these characteristics are reproduced in the experimental setting. The business network consists of 14 firms with generic names (e.g. Apollo, Delphi, Saturn). There is no network entry or exit by firms during an experiment, network size is deliberately held stable to prevent any other influences on network performance, other than could occur through treatment (discussed in the next paragraph).

Table 3.2 Reproduction of characteristics in the experimental setting

Business network characteristics	*Reproduction in the experimental setting*
Consciously created and goal directed	Here the business network is created by the experimenter. However, the experimental setting models consciously created business networks managed in the insurance industry e.g. Allianz's network of partners such as brokers and underwriting financial institutions and motor dealers (Allianz, September 2013) or Multiassistencia's home insurance network of repair professionals, insurers, banks, department stores etc. (Van Heck and Vervest, 2007 p. 31). The objective of the network is to produce and sell insurance services.
Joint production by differentiated and complementary organizations	The organizations in the business network jointly produce and sell insurance services where each firm fulfills one or more functions (e.g. insurance advice, customer acceptance, claims settlement). All functions and related capabilities are parts of orders for insurance policies that are demanded by the market.
Interdependent yet autonomous	Restrictions on investments prevent firms from delivering insurance services to the market on their own. Firms therefore rely on each other to fulfill demand. Firms are independent from each other, meaning participants operate only one firm in each experiment.
Multi-sourcing	At the start of each experiment each function is performed by three firms[43].

The network state at any time during the experiment consists of the network structure (i.e. distribution of ties and their direction) and the composition (i.e. the distribution of (specialized) capabilities among the firms). The top half of Figure 3.6 visualizes the network state at the start of the experiment. During an experiment the participants can make the following decisions for their firms: invest/specialize/divest a capability and invest/divest relationships. Their decisions can, at the end of the experiment, lead to a network state as is visualized in the bottom half of Figure 3.6.

[43] For two specific capabilities firms have to invest to develop this capability. These are not offered by the network at the start of an experiment but that can change at the next time unit.

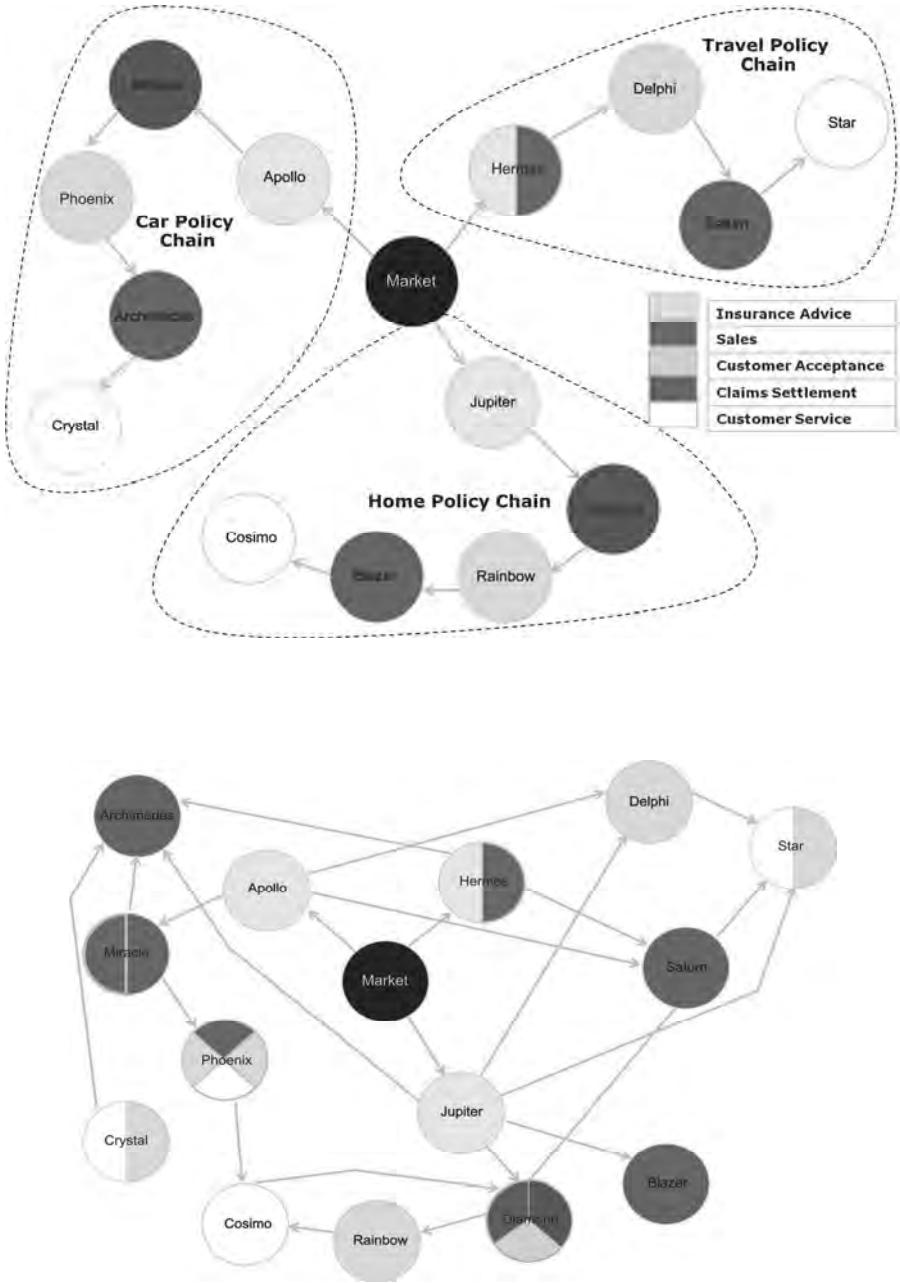


Figure 3.6 Initial and potential end network state of an experiment

The multiple colors of nodes in Figure 3.6 indicate that some firms invested in new capabilities and now perform several functions. Firm Phoenix added the insurance advice, marketing and sales and customer service to its initial offering of customer acceptance. Ingoing and outgoing arrows respectively indicate insource and outsource partnerships between firms. Firm Jupiter invested in a direct outsourcing relationship with firm Blazer for claims settlement. Moreover, firm Blazer has divested its relationships with firms Rainbow and Cosimo who therefore have been disintermediated. Specializing capabilities is not being visualized here but what occurs there is that the operating costs of a capability decrease. It represents investments in for example training the call center staff in providing more efficient customer service or in automated underwriting systems to reduce costs related to manual work of risk assessment and policy issue.

Creating and disbanding relationships will affect the density of and disintermediation in the network. Firms' decisions on capabilities, influence the potential of the network to fulfill demand for insurance policies while their decisions on linkages, collectively form and actively structure the network through which these capabilities could be delivered to the market. It is ultimately at the intersection of these decisions where the performance of the business network will be determined.

Order allocation process

An order contains one capability from each function (see Table 3.1). There are thirteen unique capabilities which can be combined. As customer acceptance and claims settlement capabilities are both product specific an thus dependent on each other, this leads to a total of 36 (2 * 3 * 3 * 1* 2 = 36) unique policies which can be demanded by the simulated customer market. This customer demand will combined into a single policy order (of five capabilities) at a set price. Throughout the experiment the brokers (Apollo, Hermes and Jupiter) are the only firms who can have a connection to the consumer market and hence are the only firms which can fulfill the customer demand. The customer demand becomes an accepted order only when a broker is able to access all the required capabilities at the demand (set) price or lower. Either a broker can deliver these capabilities itself, or it can establish relationships with other firms in the network that are able to deliver the needed

capabilities, or there can be a mix of firm and partner capabilities. Either way, if a broker cannot deliver the complete set of capabilities from its network, it cannot make a price offer for that policy.

The order allocation algorithm[44] is such that a broker with a relatively lower price offer has a higher likelihood of receiving the order. The order is not automatically given to the lowest price offer which makes the allocation more realistic. Price is not always a determinant of consumer choice for insurance, there could be other factors such as perceived or experienced service quality (Zeithaml, 1988; Schlesinger and Graf von der Schulenburg, 1993). Customer demand is unaffected by changes in the network structure and therefore stable. The same sequence of 36 possible unique orders and their maximum ask prices[45] are pushed into the network until the end of an experiment. Maximum ask prices by the market are set to exceed the highest possible price offer by brokers which means that orders never go unfulfilled due to a high selling price, but only when the network is unable to fulfill the order due to the absence of the capabilities or ties to deliver these to the market. Beyond the brokers, *suborders (i.e. orders for single capabilities)* are allocated to the firms with the lowest capability price (only influenced by specialization yes or no). In case of equal capability price (competing firms both offer either specialized or unspecialized capabilities), the firm with the oldest connection to the buying firm obtains the suborder. Thus, beyond the brokers the suborder allocation is based on the premise that that the older partnerships prevail over the newer ones.

[44] The algorithm returns a vector with the number of brokers that can process the order. If size of vector > 0 the the difference is calculated between ask price and offered price for all potential recipients (brokers). Within the sum of these differences each potential recipient is given a range with a minimum and maximum (the lower the offer, the wider the range). A random number is drawn from the sum of all differences and where this random number lies determines the recipient of the order.

[45] Price offers are not determined by the brokers themselves but through the ask price of capabilities and the number of intermediate parties and their margins. Each unique capability has the same ask price and margin.

3.4.2 Experimental Procedure

There were two rounds of data collection in 2009 and 2010. For each data collection round a pool of 17 master's level students[46] in business administration were recruited. Together these pools of students participated in a series of 33 experiments in a computer lab. We used master students as proxies for managers (cf. Van Bruggen et al., 1998) since they are at the last stage of their training towards becoming managers themselves. The duration of each experiment was approximately 20 minutes. A fixed pool was chosen to control for individual differences that could influence experiment results across pools (e.g. computer literacy, intelligence, management game experience). Learning effects were mitigated to a large extent by spending the first session on training the participants. The first session consisted of 4 practice rounds to familiarize participants with the user interface and the workings of the management game. The second session commenced with 1 practice round. The measurements from these practice rounds were not included in the dataset.

Each experiment started with an information gathering period in which participants could assess the information that was available to them and choose which decisions to implement at the subsequent decision point in order to improve business performance (see Figure 3.7). At each decision point the network state was altered by the actions of participants. During an information gathering period it was not possible to make any decisions, the network state was held constant.

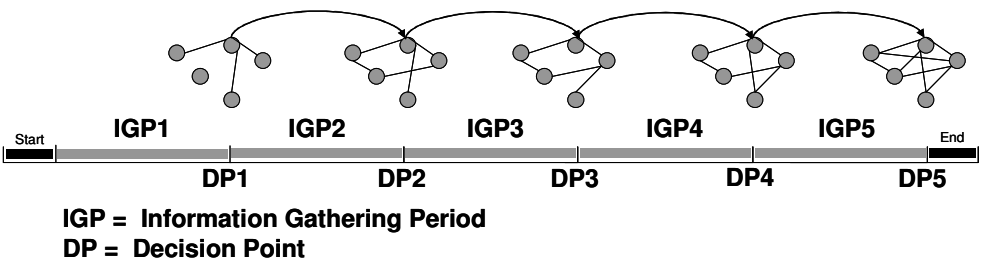


Figure 3.7 The course of an experiment (source Van Liere et al. 2008 p. 71)

[46] For each pool 3 extra master students were recruited to ensure conducting of the experiments in case of absence of several participants. Each pool had a mix of master students in marketing management, strategic management, business information management and entrepreneurship.

In each experiment participants were randomly allocated to one of the firms in the network. Throughout the experiment participants were closely monitored and not allowed to interact. Communication between participants only occurred through their decisions in the system. At each decision point participants were instructed and incentivized to maximize the turnover of their firm[47]. Depending on the capability overlap between their firms through own and partner capabilities, participants competed and collaborated with each other.

3.4.3 Treatments

Within each experiment, each participant's firm randomly received one of two treatments namely limited (k = 2) and extended network horizon (k = infinity) depending on their k-neighborhood (see next section on Measures).

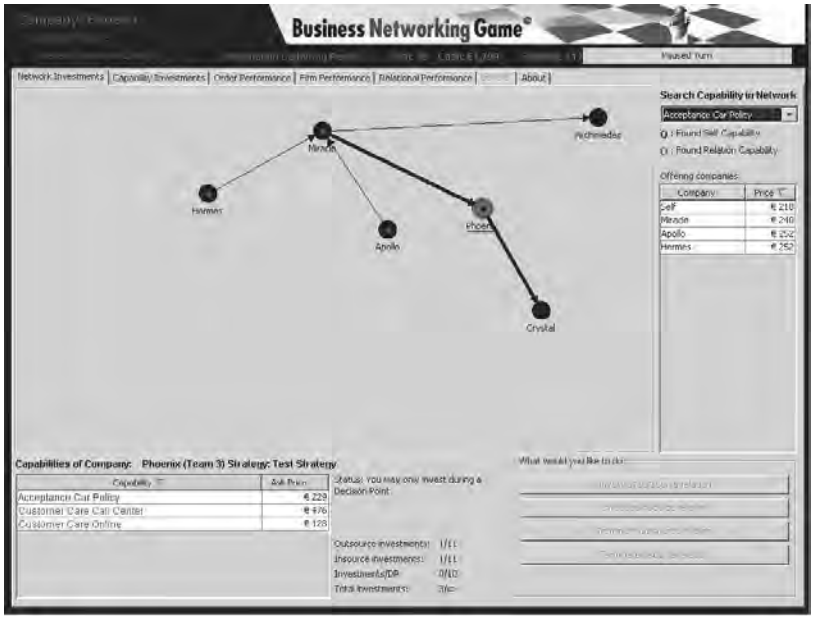


Figure 3.8 GUI screenshot for treatments k = 2 (Phoenix is the focal firm)

[47] The student team members received a fixed fee of €20 per session in which they participated on average in 3 experiments. In addition they could earn €0.50 times the factor with which they exceeded a benchmark of average collected turnover by participants that had operated the specific firm in past sessions. Finally, to prevent attrition from the team, students received an additional €10 for completing all sessions.

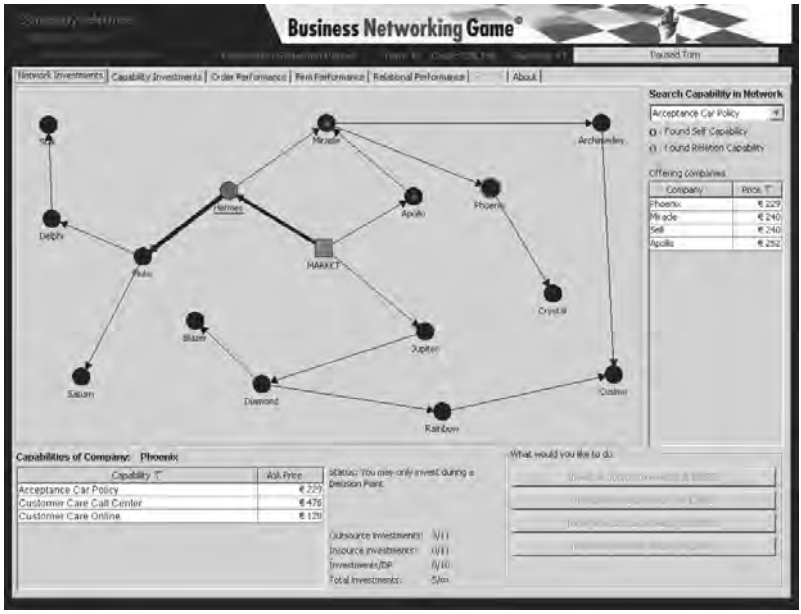


Figure 3.9 GUI screenshot for treatments k = infinity (Hermes is the focal firm)

The treatments were fixed throughout the experiment, but as new links are established (or existing links removed), a firm's k-neighborhood will change and firms may start to see more (or less) of the network. On network level the assignment of either one of the treatments to firms will lead to certain level of network transparency. As actors span and cut ties, transparency is altered as well. This means that the experimenter sets the initial level but the participants then continue to shape the transparency of the network during an experiment. During the course of the experiment the observed values of network transparency or the treatment conditions are therefore endogenously determined by the participants instead of by the experimenter.

3.5 Measures

Network effectiveness (NE_t) is operationalized as the fulfilled orders for insurance policies to what is maximally possible at time t. To create the effectiveness measure, we first established a benchmark y_t that represents the maximally effective network in terms of order fulfillment[48] starting at time unit 1 including up until t. We then calculate network effectiveness as the ratio of cumulative fulfilled orders x_t until time unit t divided over the cumulative order benchmark y_t. NE_t can vary from 0 to 1. Order requests remain in the system until either fulfilled or until $t = 5$. This means that demand from previous time units can be fulfilled at the current time unit if the network now is able to deliver the set of capabilities. Therefore a cumulative benchmark for each t was needed.

$$NE_t = \frac{\sum_{i=1}^{t} x_i}{\sum_{i=1}^{t} y_i}$$

Network efficiency (NF_t) is a measure that compares the realized prices of capabilities to their cost prices, the closer the charged prices are to cost prices, the more efficient. First we calculate the efficiency of the suborder for each capability j at time t which is f_{jt}:

$$f_{jt} = \frac{c_{jt}}{p_{jt}}$$

If p_{jt} is the realized order price for capability j at time t and c_{jt} is the cost price at time t, then f_{jt} is calculated as c_{jt} divided over p_{jt} which is the efficiency of that suborder at time t. We break the orders down to suborders or capability level, since the cost price c_j or benchmark can vary depending upon whether the capability has been specialized by any

[48] This benchmark is created by running an experiment without any participants and taking the following actions at $t = 1$, investing in the two capabilities that are not in the network at $t = 0$ and creating direct insource links in each chain from the firms to the respective broker. This allows for uninterrupted order fulfillment where the suborders traverse across links the shortest distance to the market. The resulting benchmark is therefore the maximum effectiveness the network can reach at each time unit.

firm in the network or not. In this way the efficiency f_{jt} for a capability is always a comparison of lowest possible price, given the available capabilities in the network and the realized price. It is possible that the realized capability price could have been lower because a specialized capability was offered by a firm in the network but the structure of the network did not allow it, leading to less efficiency. Network efficiency (NF_t) is calculated for each time period t as the summation of all f_j's divided over the total fulfilled suborders z for capabilities at time t.

$$NF_t = \frac{1}{z_t} \sum_j f_{jt}$$

Network transparency (NT_t) is operationalized through the network horizon (Van Liere, 2007) of the firms in the network which is based on the graph-theoretic concept of neighborhood (Bondy and Murty, 1976). To formalize the variables underneath, let the network be modeled as a graph $G_t = (V, E_t)$ consisting of a fixed vertex set V (the firms) and a directed edge set E_t (ties between these) at time t excluding self-loops. Let n represent the number of vertices in the set V and e_t the number of outgoing or incoming links between these vertices in set E_t. Let $d_t(u,v)$ be the geodesic distance between firm u and firm v (i.e. the smallest number of ties that need to be traveled to reach u from v) at time t where $u \neq v$. The k-neigborhood of firm u at time t is then defined as[49]:

$$N_{kt}(u) = \{v \in V \mid d_t(u,v) \leq k, u \neq v\}$$

The k-neighborhood of u at time t consists of all the firms v that can be reached from u in at most k steps excluding u itself. Figure 3.10 illustrates the vertices in the neighborhood of firm u for k = 2 see the dashed line and k = infinity see the dotted line.

[49] In the experiments firms had either a limited (k = 2) or a full network horizon (k = infinity). The minimum $d(u, v)$ would be 1 and the maximum $d(u, v)$ would be the diameter (Wasserman and Faust, 1994). However, in the experiment firms with full network horizon can see all ties and firms at all times even isolates thus k is ∞.

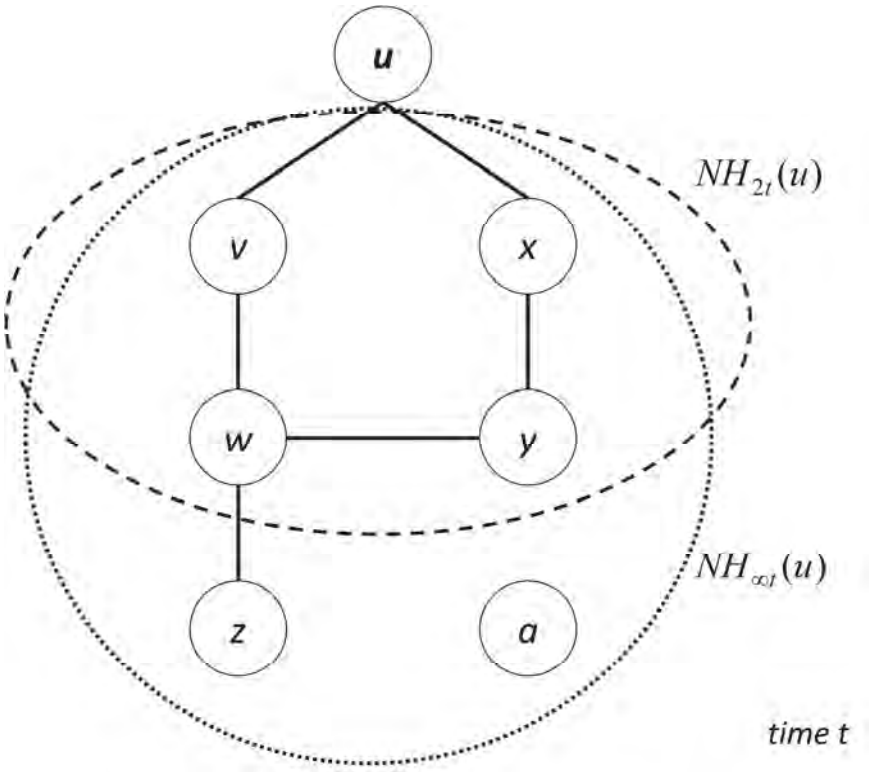


Figure 3.10 Vertices in k-neighborhood of *u* (adapted from Van Liere, 2007 p. 100)

Firm *u*'s network horizon NH_{kt} is the fraction of firms in the network that *u* can reach in at most *k* steps at time *t*:

$$NH_{kt}(u) = \frac{\left|N_{kt}(u)\right|}{n-1}$$

where $\left|N_{kt}(u)\right|$ is the cardinality of set $N_{kt}(u)$ or the number of firms in *u*'s k-neighborhood at time *t*. In figure 3.10 the network horizon of firm *u* is $NH_{2t}(u) = 0.67$ for k = 2 and $NH_{\infty t}(u) = 1$ for k = infinity at time *t*. A firm with a k-step network horizon has information about all the firms that can be reached in maximum k-steps and the ties among these firms.

In the experiments firms had either a limited (k = 2) or a full network horizon (k = infinity). We therefore divide set V into V_2 and V_{∞}. *Network transparency (NT)* is then operationalized as the average network horizon of all firms in the network at time t or:

$$NT_t = \frac{1}{n}\left(\sum_{v \in V_2} NH_{2t}(u) + \sum_{v \in V_\infty} NH_{\infty t}(u)\right)$$

NT_t is a continuous variable that is updated at each t.

Lagged network transparency is NT_{t-1} or the transparency of the previous time unit. Our independent variable is lagged because we expect the transparency of the previous time period to have an impact on the subsequent network performance, since this information may serve as input for decision-making of firms within the network resulting in a certain level of network performance at the next t.

Partnering strategies are operationalized as the density (D_t) of network at time t which is calculated as:

$$D_t \frac{e_t}{n(n-1)}$$

Operational excellence strategies (OE) are operationalized as the ratio of total specialized capabilities s among all firms in the network at time t over the total number of capabilities b at time t. Specializing a capability lowers the cost of operating it therefore is an indicator of a focus on operational excellence.

$$OE_t = \frac{s_t}{b_t}$$

Disintermediation strategies are measured as the average order path length. The order path length is calculated by inducing a subgraph from the network at t for each order x and summing the number of geodesics connecting the market to nodes in the subgraph for the suborders. In figure 3.11 the number of geodesics of the subgraph induced for order x is 1 + 2 + 2 + 3 + 4 = 12 a t and 8 at $t + 1$ due to the disintermediation of firm w. These path lengths are then divided over the sum of orders at each t which gives the average order path length of a network at a time period.

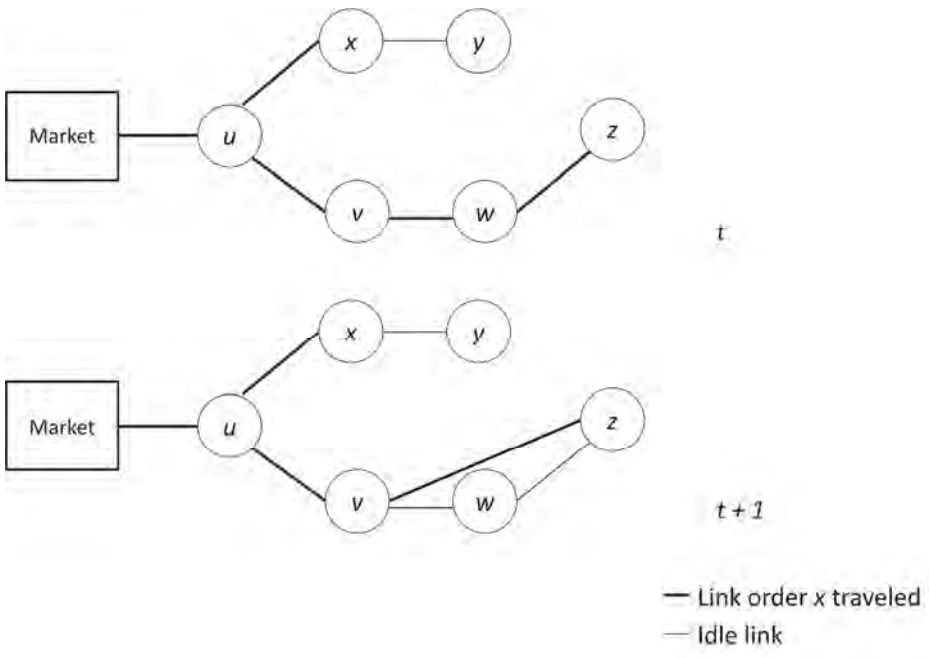


Figure 3.11 Order path lengths

3.6 Analysis

Data was collected through 33 experiments with 6 discrete time units (from $t = 0$ until $t = 5$). This dataset involves a section of units N, networks in this case, whose values are observed at T regular time periods. Such data (N x T) is also referred to as cross-sectional cross-time or panel data. The dataset is strongly balanced since each panel (or network) has been observed for the same time points (Baltagi, 2008).

In our experiments we used a controlled environment (one computer lab) with the same software, scenario, settings and the group of participants yet with randomization of participants over the firms in the business network. Experiments are a means with which to control for unobserved heterogeneity to a large extent yet there still could be network-specific effects. In such cases coefficients in the regression model may vary depending on the panel (network) under study. This unobserved heterogeneity (or omitted variables) in panel data can be controlled for using either fixed or random effects models. If random effects estimators are consistent with fixed effects estimators, then the more efficient random effects estimators are favored (Castilla, 2007). We first run both fixed and random effects models regressing the mediators (density, average order path length and ratio of specialized capabilities) on lagged network transparency. Hausman tests show that the random effects estimators are significantly different from the consistent fixed effects estimators[50], therefore we focus on fixed effects estimators.

In the hypotheses formulated before, we linked a manipulated variable X to a mediator M that in turn that predicts Y. This means that the mediating variables *density*, *average order path length* and *ratio of specialized capabilities* are endogenous or in other words, they do not randomly vary, but are dependent on levels of the manipulation, network transparency. In such cases ordinary least squares (OLS) will not provide consistent estimates because the problematic or endogenous variable M correlates with the error term in the regression equation of Y, which captures the omitted causes of Y which are not modeled (Antonakis et al., 2010). OLS assumes that M is exogenous.

[50] Hausman tests results for density ($\chi^2 = 27.65$, $p = 0.000$), disintermediation ($\chi^2 = 4.28$, $p = 0.038$), operational excellence strategies ($\chi^2 = 60.31$, $p = 0.000$).

This problem of endogeneity is solved here through structural equations modeling (SEM) without latent variables. First, fixed effects are taken out using the cluster (Mundlak, 1978) procedure, then structural equations models are estimated including the cluster means of within cluster-varying variables. This allows for consistent estimation since the cluster means vary between clusters yet are invariant within cluster, as such fixed effects are accounted for in the model (Rabe-Hesketh and Skrondal, 2008). We estimate structural equations models correlating the disturbances of *M* and *Y* and have a cluster-robust estimation of the variance.

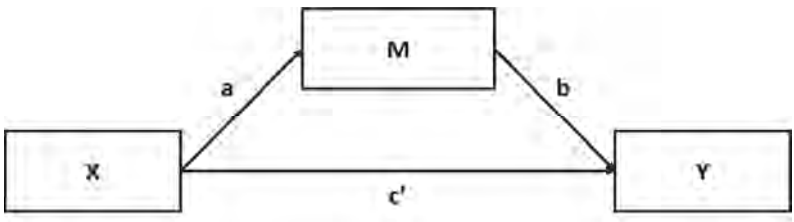


Figure 3.12 Mediation model

In the Figure 3.12, *c*' is the direct effect of *X* on Y after controlling for the indirect effects *a* and *b*. In order to determine mediation, we need assess whether the product of coefficients *ab* is significant (Shrout and Bolger, 2002; Preacher and Hayes, 2004; Zhao et al., 2010). In the following we will first run structural equations modeling for hypotheses 1-3 for estimating coefficients *a* and *b*. Then the significance of the product of the coefficients will be determined via the delta method (Sobel, 1982; Antonakis, 2010).

3.7 Results

Table 3.3 contains the descriptive summary of the panel data with the overall, between and within variation. For all the variables the variation within an experiment over time is larger than the variation between the experiments. This is beneficial for exploring the hypothesized relationships.

The overall mean for network transparency indicates that for all networks and time periods in the experiments on average 77% of the network could be seen by the firms in it. Network transparency varies between 54% and 94% across networks and by 16% within each network over time.

Table 3.3 Descriptive summary panel data

		Mean	StDev	Min	Max	Obs
Network transparency (lagged)	Overall	0,7708	0,1843	0,3190	0,9810	N = 165
	Between		0,0919	0,5438	0,9400	n = 33
	Within		0,1604	0,3565	1,1365	T = 5
Density	Overall	0,1505	0,0504	0,0622	0,2429	N = 198
						n =
	Between		0,0114	0,1289	0,1722	33
	Within		0,0491	0,0450	0,2219	T = 6
Average order path length	Overall	5,735	1,562	2,421	9,923	N = 198
	Between		0,668	4,684	7,604	n = 33
	Within		1,416	2,829	9,052	T = 6
Ratio of specialized Capabilities	Overall	0,5545	0,2780	0,0000	0,9394	N = 198
	Between		0,0782	0,3767	0,7254	n = 33
	Within		0,2670	-0,1709	0,8502	T = 6

Table 3.4 presents the results from the SEM model 1 and delta method. In this one level model the direct positive effect of lagged network transparency on density is estimated to be 0.16 and statistically significant ($p < 0.001$). The direct positive effect of density on network effectiveness is estimated to be 2.34 and statistically significant ($p < 0.001$). These results provide the needed a and b coefficients represented in Figure 3.12. Mediation is examined with the delta method that tests the significance of the product of these coefficients. The product of the coefficients 0.37 is significant ($p < 0.001$) and hence there is a mediation effect in support of hypothesis 1. These results indicate that the positive relation between network transparency and network effectiveness is mediated by higher density resulting from partnering strategies by firms in business networks.

Table 3.4 SEM model 1 and delta method results

Endogenous variables *Observed: network effectiveness, density, cluster mean density* Exogenous variables *Observed: lagged network transparency, cluster mean lagged network transparency*						
Structural	Coefficient	Robust standard error	Z	P>|z|	[95% Confidence Interval]	
Network effectiveness						
Density	2.34	0.17	13.87	0.000	2.010	2.671
Cluster mean density	-2.01	2.08	-0.97	0.334	-6.093	2.072
Constant	0.68	0.32	2.11	0.035	0.495	1.314
Density						
Lagged network transparency	0.16	0.14	11.71	0.000	0.133	0.187
Cluster mean lagged network transparency	-0.11	0.02	-4.46	0.000	-0.154	-0.060
Constant	0.13	0.01	8.6	0.000	0.098	0.156
Cluster mean density						
Lagged network transparency	$-2.03 \cdot 10^{-10}$	-	-	-	-	-
Cluster mean lagged network transparency	0.04	0.02	2.61	0.009	0.011	0.078
Constant	0.12	0.01	9.24	0.000	0.092	0.141
Variance						
Network effectiveness	0.02	0.03			0.013	0.025
Density	$6 \cdot 10^{-4}$	$7 \cdot 10^{-5}$			$4 \cdot 10^{-4}$	$7 \cdot 10^{-4}$
Cluster mean density	10^{-4}	$2 \cdot 10^{-5}$			$7 \cdot 10^{-5}$	10^{-4}
N = 165, estimation method = maximum likelihood, Log pseudolikelihood = 1225.02						

	Coefficient	Standard Error	Z	P>|z|	[95% confidence interval]	
Indirect effect	0.37	0.04	9.65	0.000	0.299	0.451

Table 3.5 presents the results from the SEM model 2 and delta method. Disintermediation is measured as the average order path length which means the higher the measure, the lower the level of disintermediation in the network and vice versa. Hence the negative direct effect found in the one level model of lagged network transparency on average order path length, -3.07 which is significant ($p < 0.001$). There is also a significant negative direct effect of the average order path length on network efficiency, -0.05 which is is significant ($p < 0.001$). The product of the coefficients 0.16 is significant ($p < 0.05$) and hence we also establish mediation here. These results support hypothesis 2 that the positive relation between network transparency and network efficiency is mediated by the shorter chains resulting from disintermediation strategies by firms in business networks.

Table 3.5 SEM model 2 and delta method results

Endogenous variables *Observed: network efficiency, average order path length, cluster mean average order path length* Exogenous variables *Observed: lagged network transparency, cluster mean lagged network transparency*						
Structural	Coefficient	Robust standard error	Z	P>|z|	[95% Confidence Interval]	
Network efficiency						
Average order path length	-0.05	0.01	-5.98	0.000	-0.071	-0.036
Cluster mean average order path length	0.08	0.03	2.92	0.003	0.026	0.133
Constant	0.49	0.16	3.01	0.003	0.1707	0.810
Average order path length						
Lagged network transparency	-3.07	0.68	-4.51	0.000	-4.412	-1.738
Cluster mean lagged network transparency	3.11	1.55	2.01	0.045	0.071	6.156
Constant	5.25	1.04	5.03	0.000	3.206	7.300

Cluster mean Average order path length Lagged network transparency	$-3.07 \cdot 10^{-8}$	$1.09 \cdot 10^{-7}$	-0.28	0.777	$-2.43 \cdot 10^{-7}$	$1.82 \cdot 10^{-7}$
Cluster mean lagged network transparency	0.03	1.146	0.03	0.978	-2.215	2.280
Constant	5.71	0.870	6.56	0.000	4.005	7.417
Variance	0.02	$2 \cdot 10^{-3}$			0.01	0.02
Network efficiency	1.44	0.20			1.09	1.9
Average order path length	0.43	0.11			0.26	0.71
Cluster mean Average order path length						
N = 165, estimation method = maximum likelihood, Log pseudolikelihood = -88.08						

	Coefficient	Standard Error	Z	P>|z|	[95% confidence interval]	
Indirect effect	0.16	0.05	3.19	0.001	0.063	0.265

Table 3.6 presents the results from the SEM model 3 and delta method. In this one level model the direct positive effect of lagged network transparency on the ratio of specialized capabilities is estimated to be 0.26 and statistically significant ($p < 0.001$). The direct positive effect of the ratio of specialized capabilities on network efficiency is estimated to be 1.41 and statistically significant ($p < 0.001$). The product of the coefficients is significant 0.37 ($p < 0.001$) and hence there is a mediation effect in support of hypothesis 3. These results indicate that the positive relation between network transparency and network efficiency is mediated by an increased focus on operational excellence in the strategies of firms in business networks.

Table 3.6 SEM model 3 and delta method results

Endogenous variables *Observed: network efficiency, ratio of specialized capabilities, cluster mean ratio of specialized capabilities* Exogenous variables *Observed: lagged network transparency, cluster mean lagged network transparency*						
Structural	Coefficient	Robust standard error	Z	P>|z|	[95% Confidence Interval]	
Network efficiency						
Ratio of specialized capabilities	1.41	0.136	10.35	0.000	1.143	1.677
Cluster mean ratio of specialized capabilities	-3.14	1.61	-1.95	0.051	-6.313	0.015
Constant	1.87	1.05	1.77	0.077	-0.200	3.938
Ratio of specialized capabilities						
Lagged network transparency	0.26	0.01	14.98	0.000	0.227	0.295
Cluster mean lagged network transparency	-0.22	0.031	-7.02	0.000	-0.281	-0.159
Constant	0.64	0.021	29.84	0.000	0.600	0.680
Cluster mean ratio of specialized capabilities						
Lagged network transparency	$2.47 \cdot 10^{-9}$	$1.15 \cdot 10^{-9}$	2.14	0.033	$2.06 \cdot 10^{-10}$	$4.73 \cdot 10^{-9}$
Cluster mean lagged network transparency	0.03	0.02	1.53	0.126	-0.010	0.077
Constant	0.66	0.02	36.83	0.000	0.620	0.691

Variance Network efficiency	0.012	0.002		0.008	0.181
Ratio of specialized capabilities	0.001	$2 \cdot 10^{-4}$		0.001	0.002
Cluster mean ratio of specialized capabilities	0.001	$2 \cdot 10^{-5}$		$8 \cdot 10^{-5}$	$2 \cdot 10^{-4}$
N = 165, estimation method = maximum likelihood, Log pseudolikelihood = 1171.32					

	Coefficient	Standard Error	Z	P>|z|	[95% confidence interval]	
Indirect effect	0.37	0.03	10.74	0.000	0.301	0.435

3.8 Discussion

In this study we examined consequences for network performance from the customer lens under varying network information architectures. We ran experiments and varied the amount of information that firms possess, leading to networks ranging from more opaque to transparent. The results show that increased actor, dyadic and structural information transparency of the network improve both network effectiveness and efficiency through partnering, disintermediation and operational excellence strategies executed by the firms. This study contributes by bringing an information-based view to business networks and linking together streams of literature on environmental scanning (e.g. Choudhury and Sampler, 1997), market and information transparency (e.g. Zhu, 2004) and interorganizational relations and networks (Van de Ven, 1976; Gulati, 1995). Moreover it includes empirical analysis testing relations between network information architecture and network performance through network processes (actor strategies) and structural characteristics (network structure and composition). So far, Moldoveanu et al. (2003a) is among the very few studies that discuss this shaping influence of information on the business network.

3.9 Conclusion

The results in this chapter present several important findings. The network information architecture is indirectly an important determinant of business network performance. The indirect effect follows from the observation made in the theory part that many other drivers of business network performance such as actor strategies and resulting network structure rely on information being available about firms and/or interactions between firms and/or the network structure in which these interactions occur. In other words, the effects of these drivers are conditional on a certain level of transparency being present in the network. It is well known for organizations that the information architecture has a large influence on its processes and performance and that different organizations have different information architectural requirements (e.g. Allen and Boynton 1991). This chapter showed that for business networks this holds as well and that by knowing the type of network information architecture we can better predict network performance consequences through the strategies that network members will pursue and the resulting network structures and composition.

The next chapter consists of a field case of a business network in the road assistance industry where network performance is studied through all three lenses developed in Chapter 2.

CHAPTER 4 Case Study

4.1 Introduction

In this chapter we validate part of the framework developed in Chapter 2 and expand it based on findings of a case study of a business network in the road assistance industry (section 4.7 shows the framework). As will be seen, this case allows for observing and analyzing the three different lenses of network performance simultaneously and in particular, how behavior on actor level influences the three dimensions of performance on network level. This has not been undertaken in scientific investigation yet. Yin (1994) terms such cases as revelatory. We conducted a single case study which enables thorough analysis and sense making of this phenomenon by concentrating on one setting and maximizing access to the evidence.

4.2 Case Selection and Description

We chose the road assistance industry in the Netherlands as our field setting. In the road assistance industry several business networks can be observed in which three types of actors combine efforts to provide roadside assistance services to automobile drivers. The types of actors are *road assistance labels*, *emergency call centers* and *road assistance companies*. Road assistance companies used to focus only on towing and salvage of vehicles, that is why they are sometimes referred to as *towers* in this study. The services these three types of firms jointly produce for automobile drivers, include not only towing but also jumpstart, fuel delivery, flat tire and lost key and lockout services[51] etc. In order to understand the workings of such networks we explain how coordination takes place between a road assistance label, emergency call center and road assistance company. Figure 4.1 displays the typical workflow between them with the order of activities.

[51] The three most common types of roadside assistance are: non-functioning starter motors, empty batteries and flat tires (Autopech.net, September 2012).

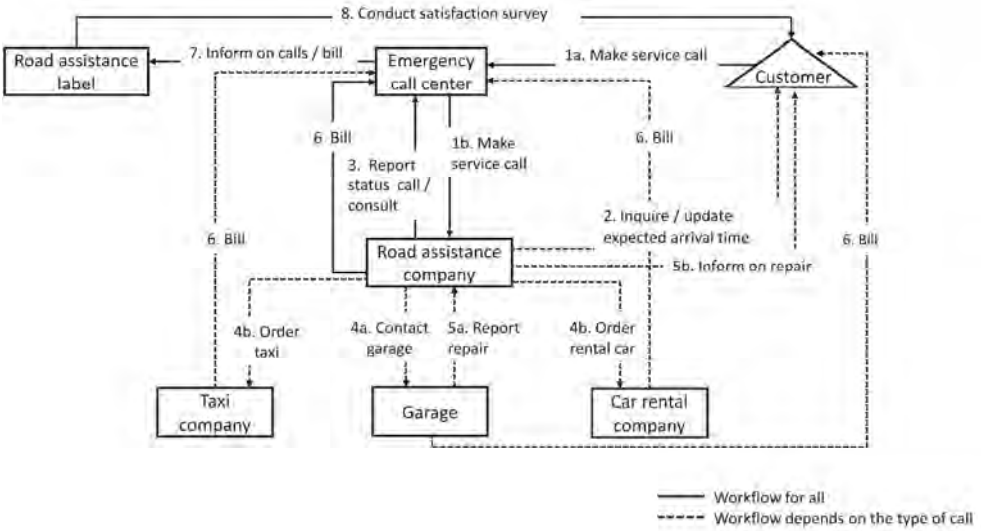


Figure 4.1 Workflow of the networks in roadside assistance (source: interviews)

A service call is made by the customer (an automobile driver) to the emergency call center that answers on behalf of the label (1a). The call center then contacts the road assistance company under contract for that region and communicates the details of the service call via telephone and XML[52] messaging (1b). With this information the road assistance company sends out a road assistant. If needed the road assistant calls the customer for further information or to indicate the expected time of arrival (2). After diagnosing the incident and servicing the customer, the road assistant reports the status of the call to the call center immediately or at least within two hours (3). If needed, the road assistance professional consults the call center for the specific rights of the customer regarding what garage to contact and what transportation services he or she is entitled to. Then a garage is contacted for car repair and arrangements for either taxi or replacement car can be made (4ab). After repair the garage contacts the road assistance company that in turn informs the customer (5ab). The garage bills the customer and taxi and rental companies bill the call center (6).

[52] XML (Extensible Markup Language) is a standards-based protocol i.e. a set of rules, guidelines, and conventions for designing data formats and structures, in a way that produces files that are easy to generate and easily read by different computers and applications (Office Microsoft, May 2013)

The label is informed by the call center of all handled service calls of a certain period and then billed for all the related costs incurred (7). Finally, if the label chooses such as Route Mobiel has done, it can administer a survey to the customer to inquire about their satisfaction of the rendered services (8).

Among the road assistance networks to study we selected that of road assistance label Route Mobiel. In order to justify its selection, the case should meet the characteristics of a business network as defined in section 2.2. It should be a consciously created, goal directed, multi-sourcing network consisting of complementary, interdependent yet autonomous firms that coordinate for the joint production of products or services. The following case and industry description shows how the Route Mobiel network qualifies as an empirical background in this dissertation.

Joint production by differentiated and complementary organizations

The workflow described in Figure 4.1 shows how the efforts of three types of actors in the network are combined to produce and deliver road assistance services. Each of the actors' activities center around either managing the customer relationship (road assistance label or seller) or serving as a customer contact point (emergency call center) or executing the road assistance onsite (road assistance company).

Consciously created and goal directed

Route Mobiel is the largest network in terms of customer base and the second largest road assistance seller in the industry. Since 1946 there had been a monopoly in the roadside assistance by a vertically integrated company, the ANWB (or the Royal Dutch Touring Club). This company operates with its own car fleet, employees and emergency call center (this division of the ANWB is called the "Wegenwacht"). Before 2004 a business model without ownership of these assets was virtually unthinkable in this industry. This notion was overthrown when Route Mobiel entered the market by managing a network of external

partners[53]. Route Mobiel formed a network consisting of one emergency call center and over a hundred of formerly auto towage and salvage only companies (depicted by the dotted circle in Figure 4.2). Meanwhile Route Mobiel only employed three people itself. Its mission was clear: to attack the monopoly by offering competitively priced road assistance services.

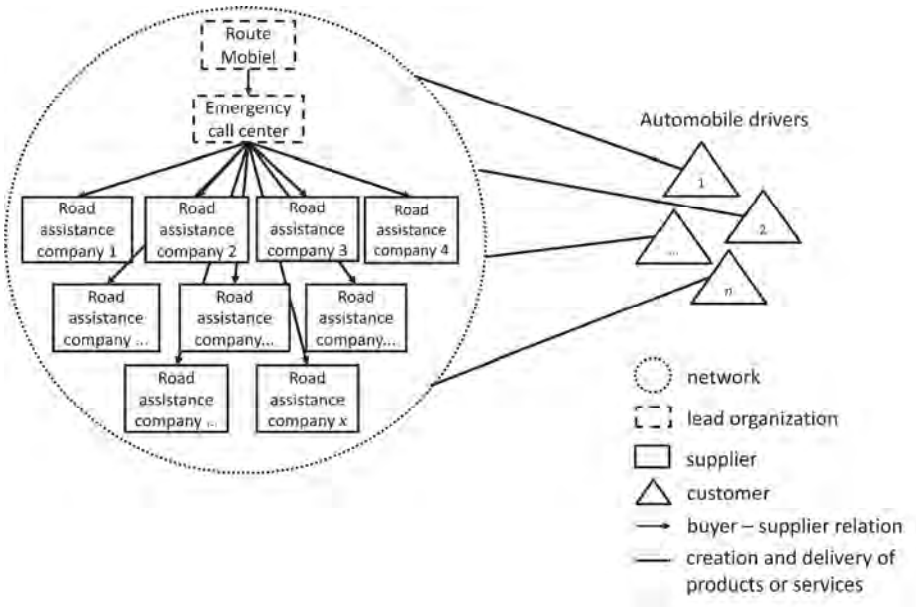


Figure 4.2 Stylized representation of the Route Mobiel network

Over 120.000 ANWB members switched to Route Mobiel for road assistance between 2004 and 2005 (Elsevier, November 2005). Over the next five years other labels[54] entered the market by mimicking the network design of Route Mobiel. However, Route Mobiel remains the second largest road assistance seller after the ANWB.

[53] In 1995 Centraal Beheer was one of the first insurers that started offering roadside assistance with their car insurance via this network, but this was not heavily promoted, so the first real challenger on the market for the ANWB was Route Mobiel in 2004 (source: interviews with road assistants)

[54] These were mainly insurers but also an emergency call center, gas station, branch organization and automotive brands.

Multisourcing

The Route Mobiel case does not involve a network where the focal firm operates with a set of carefully selected suppliers with whom they have long term relationships. These road assistance companies are hired by an external emergency call center via a tender to perform services in a district on behalf of Route Mobiel (see Figure 4.3 for a partial map of the districts). Every tender round, the downstream side of the network can and does change. This can be considered as multisourcing because the emergency call center has alternatives for suppliers in the 215 districts in the Netherlands. Route Mobiel also offers services in Europe via foreign road assistance companies that the call center has under contract. However, in this case we focus on studying the Route Mobiel network in the Netherlands.

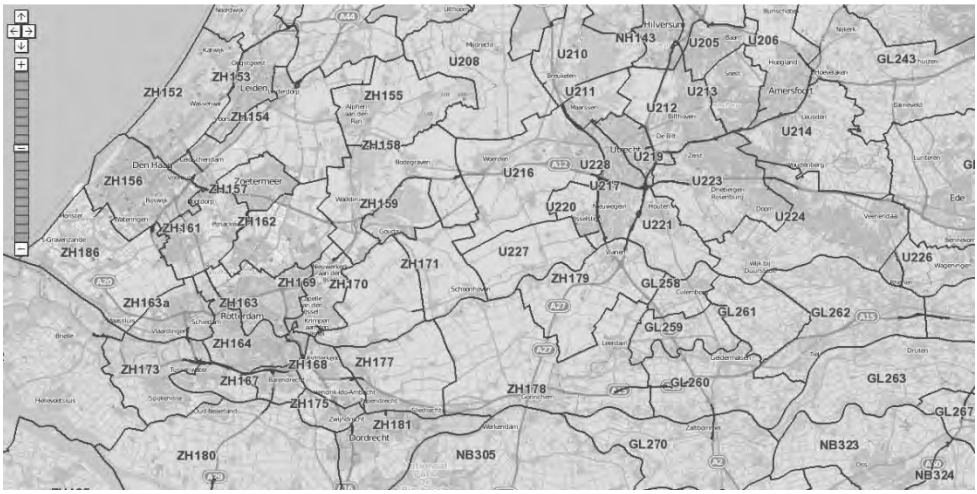


Figure 4.3 Partial map of district division 2010-2013
(Stichting Incident Management Nederland, July 2012)

Interdependent yet autonomous organizations

Route Mobiel relies on an emergency call center to hire a road assistance company for each district via a tender system. This call center contracts one road assistant for each district. Road assistants can bid and operate for more than one district, provided that they can still guarantee the required response times. The call center tenders every three or five

years and this tender is based on invitation[55]. The call center contracts the network of road assistance companies for Route Mobiel but also for other labels (e.g. onna-onna, Europeesche Verzekeringen). Labels cannot directly hire road assistance companies. Road assistance companies do not directly work for labels. The emergency call center is the bridge between them. To add, direct contact between the labels and road assistance companies in the networks in this industry is rare. Route Mobiel is however an exception, since it actively tries to communicate with the road assistance companies.

Route Mobiel, the emergency call center and road assistance companies are interdependent because they need each other to organize and deliver roadside assistance services. Each is specialized in one part of the total value chain of roadside assistance which are all integrated in the case of the ANWB[56]. On the other hand, the three actors are independent from each other in the sense that there is no common ownership across firms in the Route Mobiel network.

This description shows how the selected case meets the criteria of a business network as defined in section 2.2. Additionally for studying its performance, this network should also be activated on a regular basis. The next paragraph therefore discusses customer base and service calls.

Road assistance figures

On January 1st 2011 the Netherlands had 6.8 million automobiles registered in the name of individuals[57] (Van Beuningen et al., April 2012). On average there are between 1.200.000 to 1.500.000 service calls for road assistance per year (Autopech.net; Pechhulpvergelijk.nl, September 2012). These service calls include breakdown situations but also flat tires, lost

[55] The tender process of this call center is on invitation only (i.e. request for proposal). This means tender registration is not open to all road assistance companies. After this type of tendering the call center selects the road assistance company per district, this is called "onderhandse gunning".

[56] The ANWB also contracts road assistants during peak hours and for towage services (in Dutch they are called "piekcontracters"). Nonetheless, the organizational form of the ANWB remains more like a hierarchy instead of a network (Miles and Snow, 1992). This is because outsourcing is not so much part of a deliberate strategy but a safetynet for exceeding demand. The rest of value chain remains integrated within the company.

[57] This number includes cars of individuals with one-person businesses and cars (partly) financed by companies that individuals drive for private use such as lease cars (Van Beuningen et al., April 2012).

keys and lockouts. These service calls are considered as roadside assistance which is distinct from *emergency assistance* which is exclusively towing and salvage on the *main roads*. Road assistance is towing, salvage and other services on the *secondary roads*[58] and *other locales*. Emergency assistance is centrally coordinated by Stichting Incidenteel Management (SIMN) on behalf of Rijkswaterstaat, in English Public Works and Water Management (Incident Management, July 2013)[59]. SIMN outsources emergency assistance to only one emergency call center[60] and contracts only one road assistance company per district. On the secondary roads however, each emergency call center operates with their own network of road assistance companies on behalf of labels. There, which road assistance company is called, depends on the contract the automobile driver closed with a label and the related call center. Usually the customer itself is able to contact the call center partnered with their label. Otherwise the police calls the emergency call center for the main roads, reports the license plate of the car, upon which the call is relayed it to the right call center who contacts the road assistance company it hired for that district (Stichting Incident Management, July 2012). The secondary road net served by the Route Mobiel and other networks, is the focus of this study.

The market that meets the demand for road assistance is fragmented with many different providers. There are an estimated 4.5 million contracts closed between customers and labels (Autopech.net, September 2012). The ANWB still dominates with a market share of around 60%, Route Mobiel has 4%, automotive brands 13% and insurers 20%. The remainder is divided across parties such as Ditzo, AA-Team and BOVAG pechhulp. ANWB has 3.9 million members and handled around 1.18 million assistance calls in the Netherlands 2011 (ANWB, 2012). Route Mobiel has 168.000 customers in 2011 and in that year it handled 33.785 service calls (Route Mobiel, February 2012).

[58] The road network in the Netherlands is divided into highway and main roads in Dutch called “bovenliggend” and secondary roads called “onderliggend”.

[59] SIMN is a foundation of all emergency call centers with the aim to quickly clear the road after incidents and guarantee traffic flow and safety. Incident management falls under the responsibilities of Rijkswaterstaat which is part of the Dutch ministry of Infrastructure and Environment (Rijkswaterstaat, July 2013).

[60] This is in Dutch called the LCM, Landelijk Centraal Meldpunt.

Besides meeting these previously mentioned criteria there are requirements for access to performance data of this network and these are addressed in the following section. We will also next describe the procedures for data collection and sources of data in this case study.

4.3 Methodology

The three lenses will be used to examine the performance of the Route Mobiel network. The case study has an embedded design with multiple levels, the network (i.e. Route Mobiel) and actors (i.e. roadside assistance companies, emergency call center and label). The firm lens requires this and in general to understand network level outcomes such as performance one needs to focus on firm level behavior. Thus, there are requirements for accessing data on all types of actors in this network and also for data on performance. Initial search yielded publicly available data on customer satisfaction with Route Mobiel. Pilot interviews showed that the other requirements would be met through gaining insights from informants in the industry and further searches for secondary data were conducted. We established contact with the management of Route Mobiel to access informants from the firms in the network. Out of the 130 road assistance companies active in the Netherlands, 104 are hired by the emergency call center partner of Route Mobiel to serve customers of Route Mobiel. Through the commercial director of Route Mobiel, access to this pool of firms was granted.

With the interviews in this case study, there were two phases, first two pilot interviews with a small and medium company were held. The two companies were selected based on vicinity, with one working for Route Mobiel and the other deliberately not so, in order to get an initial idea of the network and industry. The pilot interviews served to practice interviewing informants in this industry and to familiarize ourselves with its workings and jargon. These formal semi-structured interviews were also used to improve the list of interview items and optimize the order of questions (see Appendix A for all final interview protocols). For instance, the question on how the various call centers assign calls to road assistance companies was dropped, when it was learned during the pilot interviews that this is a standardized procedure. Assignment depends on which specific company is under contract for that district instead of other allocation mechanisms (e.g. which road assistance

company responds first, is nearest to the location, etc.). The pilot interviews also served for confirming our operationalization in this industry setting of the performance concepts that will be discussed in section 4.4.

After the pilot interviews and analyzing the data from these, 13 road assistance companies of various sizes were sampled from the network of Route Mobiel. They are hired by the emergency call center for the period 2010-2013. The top three of companies in terms of handled service calls for Route Mobiel was included in the sample. After sending an e-mail with the endorsement of the commercial director Route Mobiel, managers and owners of these firms were contacted by phone to schedule an interview. In these exchanges we communicated that the purpose of the interview was to understand and improve service provision. At the start of interviews and in phrasing the questions, this purpose was emphasized as well as an interest in any recommendations by informants. This should prevent or mitigate any bias, for instance towards Route Mobiel or competitors that could have been present in their answers and allowed informants to speak frankly. Originally the aim was to keep conducting interviews with informants from road assistance companies to obtain full geographical coverage of the country. However, the first of these interviews uncovered that this would not be necessary, as the most far northern and southern provinces had small, family-run companies serving more rural areas and such firms could also be found nearby. All road assistance companies participate in different networks and also worked for the ANWB, the large companies in particular. This implies that informants from road assistance companies are knowledgeable about the workings of other networks and the ANWB through their own experiences and the feedback and insights they gain from dealing directly with end customers. This is useful for comparing levels of customer satisfaction. Additionally, the call center of Route Mobiel, another call center and two labels were accessed to get a complete picture. In between, the road assistance company from the first pilot interview was revisited to confirm and discuss some of the findings with this informant halfway through our data collection. Table 4.1 provides a descriptive summary of 25 interviewees. Names except Route Mobiel and ABNed (“Vereniging Autoberging Nederland”) are withheld due to reasons of confidentiality. As said, we conducted 2 pilot and 13 actual interviews with managers and/or owners with road assistance companies sampled from the pool of Route Mobiel.

Table 4.1 Summary of interview sample characteristics

Nr.	*Job title interviewee*	*Type of firm**	*Size***	*Number of hours*
1	Owner (**pilot interview**)	Roadside assistance company alfa	Small	1.5
2	Manager **(pilot interview)**	Roadside assistance company beta	Medium	2
3	Owner/Manager	Emergency call center alpha	Small	1.5
4	Owner/Manager	Roadside assistance company gamma	Small	1.5
5	Manager	Roadside assistance company delta	Large	1.5
6	Manager	Roadside assistance company epsilon	Small	1.5
7	Owner/Manager	Roadside assistance company zeta	Small	1.5
8	Owner/Manager	Roadside assistance company eta	Small	1.5
9	Manager	Roadside assistance company theta	Large	2
10	Owner	Roadside assistance company iota	Large	1.5
11	Owner/Manager	Roadside assistance company kappa	Medium	2
12	Owner/Manager	Roadside assistance company lambda	Large	1
13	Owner	Roadside assistance company mu	Large	1.5
14	Manager	Roadside assistance company nu	Large	1
15	Owner/Manager	Roadside assistance company xi	Medium	2
16	Owner/Manager	Roadside assistance company omicron	Large	1
17	Account Manager	Emergency call center beta	Large	1
18	Manager Mobility	Emergency call center beta	Large	1
■	Owner **(pilot interview 1)**	Roadside assistance company alpha	Small	--
19	Public Relations Manager	Roadside assistance label alpha	Small	0.5
20	General Secretary	Branch association ABNed	--	0.5
21	Manager Operations	Route Mobiel (or label beta)	Medium	1
22	Specialist Communications	Route Mobiel	Medium	1
23	Commercial Staff	Route Mobiel	Medium	1
24	Commercial Director	Route Mobiel	Medium	1
25	Manager Research and Information	Roadside assistance label gamma	Large	1.5
				Total: 33 hrs.

* A road assistance label such as Route Mobiel sells road assistance while a road assistance company provides the roadside assistance to automobile drivers.** Size of the road assistance companies is based on vehicles and personell < 15 people; 5 vehicles = small, > 20 vehicles; 20 people = large, size of the emergency call centers and road assistance labels is based on number of customers.

The remaining 10 interviews were with 1 informant from a branch association, 3 from two emergency call centers and 6 informants from three road assistance labels. In addition to these 25 interviews we also did e-mail interviews with the commercial director of Route Mobiel and president of branch association VBS. The industry has two branch associations namely ABNed and VBS, informants from both associations were accessed for the collection of primary data in this case study. The advantage of the road assistance companies was that these are according to Dutch standards small medium enterprises (below 250 employees) and the managers / owners are knowledgeable on the strategic as well as operational matters of their business. That is why only one informant was accessed per road assistance company. In the case of the emergency call centers and labels, more than one person was interviewed whenever possible. All three types of actors in the Route Mobiel network have been covered with multiple informants for each. Having variety and multitude in the sample within and across actor groups allowed us to replicate and corroborate findings (Eisenhardt, 1989a). This sample allowed us to reach a thorough understanding of the Route Mobiel network and the road assistance industry. This primary data was collected from May until August in 2011. All interviews with emergency call centers and road assistance companies were held onsite. Interviews were conducted in a two person team with one researcher responsible for interacting with the informant while the other focused on recording, taking notes and making observations (Eisenhardt, 1989a, p. 538). All interviews were semi-structured since there was a series of the same questions per type of actor, both closed and open-ended and there was room to probe, confirm and pose questions for clarification e.g. “What else leads to high customer satisfaction?” “So, customers do not contact you directly?” “What do you mean by lost out?”). The duration of the interviews generally ranged from 60-120 minutes and interviews were held in Dutch allowing informants to speak in their native tongue. With the permission of the informants, audio from the interviews were recorded. We were asked to switch off the recorder at a point during three of the interviews due to the sensitive nature of the information, however these instances were rare and brief. For data analysis, all interviews were fully transcribed verbatim. Transcripts had an average length of around 18 single-spaced pages with fontsize 12 and around 450 pages from the 25 interviews. Table 4.2 lists all data sources in this case study.

Table 4.2 Data sources

Primary	In-depth interviews, notes, observations
	E-mail interviews with Route Mobiel and branch association VBS
Secondary	(Corporate) websites (e.g. ABNed.nl, Anwb.nl)
	Industry and company documents
	News articles, press releases & trade publications
	Customer satisfaction survey (routemobiel.tevreden.nl)

Additional primary data were e-mail and telephone interviews with the president of a branch association and the commercial director of Route Mobiel, notes taken during interviews and observations from the field (i.e. visiting control and planning rooms of road assistance companies and emergency call centers and witnessing the response to a jumpstart assist call near a customer's home, see Figure 4.4). The other evidence in this case was gathered from (corporate) websites, industry documents, news articles and customer satisfaction survey data through a platform by Tevreden.nl. This is an independent market research company that conducts surveys among Route Mobiel customers and makes this data publicly available on a platform. This customer satisfaction survey includes questions such as an overall grade for the service (from low = 1 to high = 10), description of the service experience, likelihood of recommending Route Mobiel to family and friends (from low = 1 to high = 10) and the arrival time (within 30 minutes yes or no).

Each step of the research process was documented, which enhanced the reliability of our research (Yin, 1994). The coding procedure followed in this study is termed constant comparison (Glaser and Strauss, 1967; Strauss and Corbin, 1998) which maintains an ongoing close connection between codes and data.

Figure 4.4 Jumpstart assistance at a customer's home

After conducting interviews 1 until 13 and analyzing the data from these, we no longer obtained very different or new answers to our questions. Interviews 14 to 25 did not show any new categories or variations or properties of existing categories that had not been identified before. This indicates some evidence for theoretical saturation. This is the point at which subsequent data incidents that are examined, provide no new information (Locke, 2001 p. 53). This is also support for the findings being representative for the whole Route Mobiel network. Hence no further data was collected after the 25th interview.

Before we proceed with discussing the findings, a separate section is devoted to the operationalization of the concepts.

4.4 Operationalization of Concepts

Chapter 2 provided definitions and concepts of network performance through the lenses of firm, systems and customer (see section 2.4). For studying network performance in the field, we selected the following concepts for evaluation for each lens. The concepts for network performance are: 1) goal attainment 2) customer satisfaction 3) congestion and connectivity robustness.

Table 4.3 Measures and data sources

Firm lens	**Data source**
Goal attainment is measured as firms' perceptions of attaining their objectives for profit and for performance quality through participation in the network.	Interviews
Customer lens	
Customer satisfaction is measured as the scores for overall satisfaction given by Route Mobiel customers and the perceptions of customer satisfaction of the firms in the network providing the road assistance services.	Surveys Interviews
Systems lens	
Congestion robustness is measured as firms' perceptions of ability of the road assistance companies and the emergency call center to handle to peaks in service calls and the response times reported by customers and press releases during peak periods.	Interviews Surveys Press releases
Connectivity robustness is measured as firms' perceptions of the ability of the road assistance companies and the emergency call center to continue functioning when faced with disruptions such as technical difficulties, when a towtruck breaks down or is caught in traffic.	Interviews

We select these because these were identified in Chapter 2 and initial study on the industry and pilot interviews indicated that this data was available to study. Next it needs to be clear how these concepts can be captured in this particular setting (i.e. translation to the field). For some concepts this is more generic and straightforward than others. Reading into industry shaped the ideas of what type of questions would allow us to examine the concepts in practice (e.g. for congestion robustness, what happens when there are peaks in service calls?). During the pilot interviews the questions had the intended result. Questions

became more focused (e.g. connectivity robustness, disruptions for road assistance companies are breakdowns of trucks and traffic jams) and we proceeded with this protocol.

Appendix A lists the interview protocols. Table 4.3 displays the operationalizations and data sources used for performance evaluation. Triangulation of data from various sources strengthens the confidence in the accuracy of the results (Jick, 1979). Secondary data on customer satisfaction was already available via the Tevreden.nl platform and press releases but the majority in this case study is primary data collected from interviews.

Next is the discussion of the findings and theory development which will take place in two steps or two sections. First, each of the three lenses will be adopted to determine the level of performance of the Route Mobiel network (in section 4.5). The discussion in this first step deals with outcomes (the "what") and will therefore not be that detailed. The second step however, is more elaborate since it uncovers the factors (the "why" and the "how") that cause these outcomes. This is done through analysis and discussion of the evidence and by linking the evidence to the theory (in section 4.6). For brevity and since all managers and owners interviewed also perform road assistance services themselves, they will be referred to as road assistants in the following. We also found that there are many similar conditions for the actors in this network and the wider industry. Whenever relevant, the discussion will therefore stretch beyond the Route Mobiel network.

4.5 Evaluation of Network Performance

Goal attainment: low

To evaluate the outcomes in the Route Mobiel network through the firm lens, the focus was on the largest part of the network which are the road assistance companies. We inquired them about goal attainment for profit and detected differences between the desired and actual performance quality. Based on the opinions and statements of road assistants and branch associations and indirect support from secondary data underneath, we consider goal attainment in this network as low.

When asked directly about profit goal attainment only two out of ten road assistants answered that working for Route Mobiel helped in achieving their goals for profit. The other eight road assistant provided explanations why this was not the case, as will be discussed in section 4.5.2.

Indirect support for low profit goal attainment in this network and also the industry in general comes from a combination of three additional findings. Firstly, all road assistance companies in the network work for almost every call center which could mean that they cannot run a business by working exclusively for Route Mobiel. Secondly, interview data showed that prices for road assistance have been decreasing for the past 20 years and thirdly, there has been a declining number of road assistance companies in the industry. The decline is the result of exit from the road assistance market, prohibitive investments for market entry, bankruptcy and consolidation. Since 2002 at least 60 companies have left the industry (Trouw, April 2005). Within the data collection period a small road assistance company we interviewed at the beginning, was declared bankrupt by the court and taken over by a large company (Faillissementdossier.nl, August 2011). Four road assistants predict that bankruptcy will continue in the future because there are road assistants who have been accepting prices to a point where they cannot run a viable business anymore.

The president of the branch association VBS confirmed that because of the low number of emergency call centers, in general road assistants are willing to go far in order obtain work (VBS, 2012). They do this by tendering for work at rock-bottom prices. The call centers realize the lengths at which the road assistants are willing to go and often also ask for a lowest price guarantee. According to the president: "*Cost price is too often overlooked in this industry including by the road assistants themselves.*" Further, new entrants into the market are unlikely because of the high required investments. Due to the uncertainty they face, existing road assistants have trouble getting bank loans for investing in the current situation let alone start-ups. Many small family-run road assistants are disappearing, as this manager explains:

"Those 6 call centers[61] *have played hard ball. In the towage industry, yes they really have destroyed companies and driven people to despair…" (Road assistant large company)*

Therefore we consider attainment of profit goals in the Route Mobiel network to be low. As for performance quality (or operational goals) we again found an industry wide phenomenon. Road assistants want to offer more than what they are being compensated for by all emergency call centers. Three road assistants explicitly discussed discrepancies between the desired service levels of road assistants and the actual service levels enabled by the current compensation in this network and also the industry in general. These comments clearly show their intention, that they are not satisfied with delivering marginal quality of services to customers:

"In the end you can want to do it all, but when you cannot pay it, it stops. And yes, now and then there is a struggle that I say well: we actually get paid too little for what I want to offer. So in other words: I would like to offer an 8 or 9, but the customer [label] only wants to pay for a 7." (Road assistant large company)

"When they accept a 6, you should not want to deliver a 9. Maybe they want to work with a party that provides a 9 but if the paid rate implies that they want to work with someone that is a 6 in terms of quality, it is a neat trick to ask somebody who delivers a 9 a price of a 7. When you have more to offer, you would expect that people would consider this. But what happens often is that because of the emphasis on price, quality is often forgotten." (Road assistant large company)

"But the paid rates are under enormous pressure. That's just annoying to observe...on the one hand, you would like to do more, but at some point there is simply no room for this. Yes. That is quite annoying. At some point you can no longer really offer what you want to offer." (Road assistant medium company)

The road assistants also described how performance quality is not the main focus of emergency call centers in the tender but rather price, and that it creates a disincentive and a barrier for road assistants to perform higher. The president of the branch association VBS confirms that "road assistants all have quality" but that "financial means to invest in top specialists are hardly there" because of the call center and labels. Therefore we consider attainment of operational goals in this network to be low as well.

[61] Counting before the merger of two emergency call centers and including the internal call center of the ANWB. There are currently 6 emergency call centers active in the road assistance industry, counting the ones above and the newly founded AA-team.

Firm lens: Network performance	
• More than half of the road assistants asked say that profit goals are not being attained. Indirect support is found through a combination of the participation in all other networks, decreasing prices and a declining number of road assistance companies. • Discrepancies between desired and actual performance quality are identified due to a strong focus on price by the emergency call center. Lack of financial means to invest in higher performance quality is confirmed by a branch association.	Low

Based on the findings altogether we conclude that seen through the firm lens, there is a low level of network performance[62].

Customer satisfaction: high

Based on the findings underneath we consider the performance of the Route Mobiel network seen through the customer lens as high. This conclusion results from a combination of the opinions of road assistants and their comparison of Route Mobiel and the ANWB and customer satisfaction survey scores.

Road assistants are the only actors in the network who deal with customers face-to-face. They are able to compare customer satisfaction among different labels and emergency call centers. When eleven road assistants were directly asked how they evaluated the combined performance of Route Mobiel and the emergency call center towards customers, nine road assistants were positive or very positive on this matter. Informants highlighted the emergency call center in their evaluation since it interacts more directly with customers. They describe the emergency call center as "customer oriented and is about practical solutions", "easy to work with and fast", "treats customers very well". One road assistant was neutral he said that services are the same quality everywhere because he does not do work differently per customer. The other road assistant said that customer satisfaction

[62] A classification of medium or high would have occurred if half or more than half of the road assistants asked said that they achieve their goals for profit by being in the network, without the indirect support or at least variations in the experiences of the road assistance companies regarding decreasing prices and with few or no discrepancies between desired and actual performance quality or perhaps only for certain types of road assistance companies (e.g. small).

depends on the expectations and preferences of the customer. Some drivers prefer to continue with their own car while others care more about speed of service and mobility.

The first type of people ("continue with own car") tend to choose the ANWB for road assistance according to this informant. Five other road assistants claim that the mobility guarantee is what motivates customers to buy road assistance from Route Mobiel. Many of our informants from the Route Mobiel network believe that the ANWB can better meet the demands of this first type, while Route Mobiel is more apt to serve the latter category of people ("continue quickly"). When road assistants compared Route Mobiel and the ANWB phrases such as "two different products", "time is a distinguishing factor" came across.

Several road assistants also work for the ANWB as external partners and inform us that Route Mobiel asks a lower repair rate percentage than the ANWB. On the other hand Route Mobiel offers a within 30 minutes response guarantee as part of the package to customers while the ANWB does not offer any such guarantee. An informant from the ANWB says that such guarantees to customers are impossible because of massive numbers of incoming calls and the differences in urgency, in his words: "The world changes every minute". This concurs with the two different types of customers for road assistance. Furthermore, nine road assistants (including one who does not work for Route Mobiel) believe that total service times of the Route Mobiel network are shorter than the ANWB because of the high demand versus available capacity and use of vans instead of multifunctional trucks. While multifunctional trucks can both deliver road assistance services and tow cars if necessary, vans can only provide road assistance. Two road assistants draw the comparison between Route Mobiel and the ANWB for customers:

"It [the ANWB] is an association which is non-profit, so it is very different. If they are full, they are full and then they wait. And that leads to waiting times that we hear regularly from people. Well I think a lot of people, if you are standing somewhere with your wife and small children with car trouble, you want only one thing and that is to get out of there as soon as possible. Either repaired or towed or whatever. But I want to leave here, I want to go home, I want it solved. Well, I think Route Mobiel really has something to offer there by working with private towers who have something to defend I think." (Road assistant medium company)

"If the Wegenwacht [road assistance division of the ANWB] comes and he cannot fix it, then a tower needs to come..so also for the people it's important, not to pick on the ANWB, but you hear that the waiting times at the Wegenwacht are pretty longer than the half an hour that we have and then they often also try to fix it still, so such a Wegenwacht is for half an hour seeing what he can do. If it does not work then it's an hour and a half later. Then a tower needs to come to pick up the car, which also takes another half an hour. Those people will be occupied for the whole afternoon." (Road assistant small company)

The manager mobility of the call center used by Route Mobiel gives additional insight into the differences:

"The advantage of the ANWB is that you can expect a slightly more extensive road assistance service from the Wegenwachter because he has a very special van and went through years of training, is really a full-fledged mechanic. But the downside of it is, that there are always driving less than needed, they are obviously expensive to have driving around. So you should probably wait between an hour and hour and a half and more waiting if it is busy, until you're next. Because they have to cover a large territory, and when it is not possible to repair your car then still a towing truck or transporter needs to be called. So in the best case you are waiting there an hour for help to arrive who tries to fix for 45 minutes, if that doesn't work then he'll say I send my colleagues to tow you away and then you have to wait 45 minutes more…Yes. and that is something that sets us apart, specifically from that." (Manager Mobility large emergency call center)

An independent market research company collects data on Route Mobiel through customer surveys after incidents and publishes this data on a publicly available platform. 2578 of the 33.785 service calls were surveyed. That is a relatively small percentage so there could a non-response bias, however it would be likely that dissatisfied customers will use the opportunity to provide their evaluation via the survey and ventilate their grievances. Moreover, we base our conclusion on the combination of the following results and the insights discussed above. Customers were asked to provide an overall grade for the service from low = 1 to high = 10. The average score in 2011 was 8.2 (with a month minimum of 8.0 and maximum 8.6). 94,7% of those customers were willing to recommend Route Mobiel to their friends and other people in their circle. In 88,3% of the cases the road assistant was there within 30 minutes, in 57% of the cases the car was repaired on location (Route Mobiel Tevreden, February 2012). The following selection of reviews on the rendered services by 11 different road assistance companies and the emergency call center, shows further insight into customer satisfaction.

Review date February 17, 2011 Location: Amsterdam

"My brake was stuck and I was about to call my garage. Then I realized that I had purchased road assistance home service. So called them. Half an hour later there was a big truck in the street and I thought he would take my car with him. But a hit with the hammer on the brake solved the problem. Quick and painless!" (rated 10 out of 10)

Review date February 17, 2011 Location: Hellevoetsluis
"Two months ago we had to use our membership of Route Mobiel for the first time. Not knowing what time to expect in terms of customer service, speed, etc., I can only say that I am very impressed with the service of Route Mobiel. This company understands that the people who call are in unpleasant circumstances, the staff is friendly, helpful, thinks along with you, makes clear agreements and they are, when they make an appointment on the phone, on the spot within the agreed time." (rated 9 out of 10)

Review date March, 2, 2011 Location: Zwolle
"Great service. When I called, help was there within half an hour." (rated 9 out of 10)

Review date April 14, 2011 Location: Groningen
"Breakdown is very annoying and happens at inconvenient times. I was however helped very well by the operator and I was reassured help would arrive within half an hour. However, help was present within fifteen minutes and the handling was excellent." (rated 9 out of 10)

Review date July 1, 2011 Location: Leersum
"Recently I have had to rely on Route Mobiel three times in a short timeframe, one of these times was in the middle of the night. Every time I was assisted fast, professionally, efficiently (despite the late hour) and in a friendly manner by both the call center agent as well as the road assistant on location. Nothing but appreciation for the entire Route Mobiel company!" (rated 9 out of 10)

Review date August 10, 2011 Location: Rotterdam
"Professional service delivery (friendly, calm, expert) during a predicament after the breakdown of our car, just after the exit on the south side of the Maastunnel. Within half an hour we were out of this bad place and on our way to the replacement transport. Hats off to Route Mobiel!" (rated 10 out of 10)

Review date August 11, 2011 Location: Capelle aan den IJssel

"For describing my experience with Route Mobiel I need use only one word: SUBLIME! Mechanic was very customer friendly and tried to figure out the cause in all possible ways. The cause was found and the car towed to the dealer!" (rated 8 out of 10)

Review date September 6, 2011 Location: Utrecht
"Really great service, the tow truck arrived very quickly and the driver knew exactly how he to get my car out of the parking garage, really a very friendly guy also the lady of emergency call center took the time to listen and immediately knew that the car could not be repaired onsite." (rated 9 out of 10)

Review date September 7, 2011 Location: Ittervoort
"Saturday night on a weekend trip. Less than 30 kilometers from home we get car trouble on the highway. Within 10 minutes we were removed from the highway by a towing company. Given a replacement car and back on the road. Really well organized." (rated 9 out of 10)

Review date October 6, 2011 Location: Rossum

"Easy to reach, good advice and explanation of what you could possibly do yourself and if the problem needs a mechanic! If so, the mechanic is on the spot very quickly!" (rated 9 out of 10)

Review date October 31, 2011 Location: Leeuwarden

The aid arrived on the scene within half an hour. Timing belt was broken and the car could not drive anymore. I was taken along to the garage where I got coffee. People were very nice and offered me a replacement vehicle so I could drive home. Excellent service. Kind and caring staff." (rated 10 out of 10)

Customer lens: Network performance	
• More than half of the road assistance asked evaluated the performance of Route Mobiel and the emergency call center towards customers as (very) positive. • Around half of the road assistants interviewed believe the mobility guarantee is what motivates customers to choose Route Mobiel. • More than half of the interviewed road assistants believe the service times of the Route Mobiel network are shorter than the ANWB. • The overall grade for service in customer satisfaction surveys in 2011 is 8,2 with a month minimum of 8.0, the grades are supported with comments in customer reviews.	High

Based on these insights we conclude that seen through the customer lens, there is a high level of network performance[63].

Congestion robustness: medium

To examine performance of the Route Mobiel network through the systems lens, we focused on how well the firms in this network are able to handle to peaks in demand (congestion robustness) and disruptions of services (connectivity robustness). The findings indicate that this dimension of network performance can be considered as medium.

[63] A classification of medium or low would have occurred if half or more than half of the road assistants had evaluated the performance of Route Mobiel and the emergency call center combined as negative, if the road assistants would compare Route Mobiel as worse than the ANWB on all fronts and if the average score or the month minimum of the customer satisfaction survey were below 7 out of 10.

We base our conclusion on the response times during peaks and disruptions as described underneath.

Congestion robustness has to be discussed in relation to the demand and therefore the size of the customer base, Route Mobiel serves 168.000 customers and its network consists of around 100 road assistance companies with 1.300 road assistance professionals based in 180 locations. Winter and summer are times when there are peaks in demand for road assistance, that is why we will focus on these periods for 2010/2011 and 2011/2012 for performance evaluation.

In the first week of December 2010 Route Mobiel received three times as much calls than normal. Customers waited on average 35,5 seconds before being answered by an employee the call center and on average the response times of road assistants were within 32 minutes, with the exception of traffic jams and inaccessibility due to extreme slippery roads. This press release was titled "Route Mobiel passes stress test" (Route Mobiel press release, December 2010). Average customer satisfaction for December was rated an 8,3 out of 10 for 130 calls (Route Mobiel Tevreden, February 2012). In spring 2012 around half of the drivers in the Netherlands had been sceptical about the weather forecasts and were not prepared for the cold weather. In the first week of February 2012 the number of service calls rose again with 300%. Even compared to the extremely cold winter of 2010 this was an increase of 75% (Route Mobiel, February 2012). According to the account manager of the call center of Route Mobiel overall response times by the road assistants at this time were all right, around 40, 45 minutes. Both emergency call center and road assistants can expand their own capacity if demand requires it. In fact, Route Mobiel switched to the current call center in April of 2009 because of many complaints it received on the unavailability of the then call center in the summer of 2008 (Route Mobiel Tevreden, October 2012). During busy times which can often be anticipated such as the summertime, the current call center relies on on-call staff and workers that can log in to the systems and work from home. Route Mobiel's manager of operations discusses this:

…well our call center is always just very accessible..ehm..so also in the summer period there is sufficient scaling up, because it is simply an efficient system that they work with. And I don't know how the ANWB arranges this but our waiting times...the last two months [July and August 2011] abroad we had an average waiting time of 1,5 minute. In the time of the former call center we have seen waiting times of 40 minutes...to get somebody on the

phone...and those kind of waiting times you hear from the ANWB...the past two years we just have not had that...Yes for example with the call center there is the possibility to work from home, so when it's busy someone can log in and pitch in." (Manager Operations Route Mobiel)

Six road assistants were asked about the ability of the current call center of Route Mobiel to meet exceeding demand. They all think that in general the call center can handle a large amount of calls, but some of them say that peaks in the summer remain and that waiting times can and still do increase:

"I believe it has improved somewhat, but especially in summer, the peak season, which is a bit annoying really. You have to be with the customer within 20 minutes or half an hour and then you have to arrange a replacement car, and then you just are on hold for 20 minutes. You stand there with that customer, waiting to help him along...And that is something that is generally experienced as annoying but I think they have sorted that out now though. (Road assistant large company)

"... Those are peaks. Now it's holiday time, now they go, the call center of Route Mobiel is going to be very busy, of course and of course, we will see the waiting times on the phone will be longer." (Road assistant large company)

"Yes of course but everyone has that [exceeding demand]. And what I said, this is the same in the holiday season...And the call center of Route Mobiel tries to improve this every year but well, those are peaks." (Road assistant large company)

There are deviations from the response times during peaks even though these peaks can be anticipated. For road assistants the times can go up to 40 minutes and the waiting times with the emergency call center can increase in the summer period as the road assistants say. Therefore the level congestion robustness of the Route Mobiel networks is determined as medium[64].

Connectivity robustness: medium

As for connectivity robustness, neither road assistants nor Route Mobiel informants recall any disruption in the service of the emergency call center. The call center has emergency

[64] A classification of low would have occurred if response times are doubled or more than that during peaks, a classification of high would have occurred if response times would only deviate from the normal response times with 5 or less minutes. In 2012 the response times were around 30% to 50% more. Waiting times for the emergency call center remain during peaks, hence the classification medium.

plans which should enable them being operative almost immediately after technical disruptions. There is also an evacuation plan developed by the emergency call center that should have them up and running within 12 hours or faster in most cases. However, an evacuation has never taken place. Breakdowns of trucks are rare occurrences according to the road assistants and if these happen, then they have enough means to solve the problem by themselves. Getting stuck in traffic is a problem, sometimes road assistants are allowed to use the emergency lane (however if this is being used as an extra lane for rush hour it stops, as well when there is a pile of snow there). Safetynet agreements exist among road assistance companies to aid each other when demand exceeds capacity. However, as we will see in 4.5.2, such agreements are declining and they are being troubled by the current tender system. Thus, the performance level here is also medium[65].

Based on the insights above we conclude that seen through the systems lens there is a medium level of network performance.

Systems lens: Network performance	
• Both road assistance companies and emergency call center can expand capacity. Response times of the road assistants during peaks deviate between several minutes up to 10-15 minutes extra. The waiting times for the emergency call center remain during summer. • The emergency call center has an emergency plan with an evacuation plan. Safetynet agreements are declining and being hindered by the current tender system.	Medium

Complementarity of the lenses

As seen evaluation of network performance through three different lenses lead to three different levels of outcomes:

Network performance	
Firm lens	Low
Customer lens	High
Systems lens	Medium

[65] A classification of low would have occurred if there were no precautionary measures such as an emergency plan and safetynet agreements. A classification of high would have occurred if in addition to the current situation more than one safetynet agreement was made per road assistance company and if the use and effectiveness of these agreements was not found to be disrupted by competition in tenders. Hence the classification medium.

This supports proposition 1 developed in section 2.5.4 in Chapter 2:.

Proposition 1 (from section 2.5.4): *Network performance is a multi-dimensional construct*

This indicates that the lenses are not interchangeable and that they focus on different dimensions of performance. This finding suggests that these lenses on network performance are complementary and that for evaluating network performance all three dimensions need to be taken into account.

4.6 Explanation of Network Performance

Institutional Logics and Network Processes

Explaining the performance levels found in this case is the next step is this study. We focused on the behavior of the firms in the network with regard to network processes and network structural characteristics and analyzed statements in the interviews (e.g. descriptions, opinions, experiences) and other data from the case. The impact of network structural characteristics (network structure, integration, network stability) and network processes (information sharing and actor strategies) could be discerned. In this sense we found further support for the building blocks and factors in the preliminary integrated framework from Chapter 2.

However when zooming in on the processes the current model fell short in explaining the phenomena in this business network. What emerged from the analysis of network processes were two distinct patterns on how to organize and work in the road assistance industry that have countervailing influences on network processes and in turn, network structural characteristics and network performance. In theoretical terms, these patterns are sets of belief systems and related practices titled institutional logics (Alford and Friedland, 1985). In the following we will first define institutional logics and discuss institutional change in the road assistance industry and then formulate arguments for the theoretical mechanisms displayed in black in Figure 4.5.

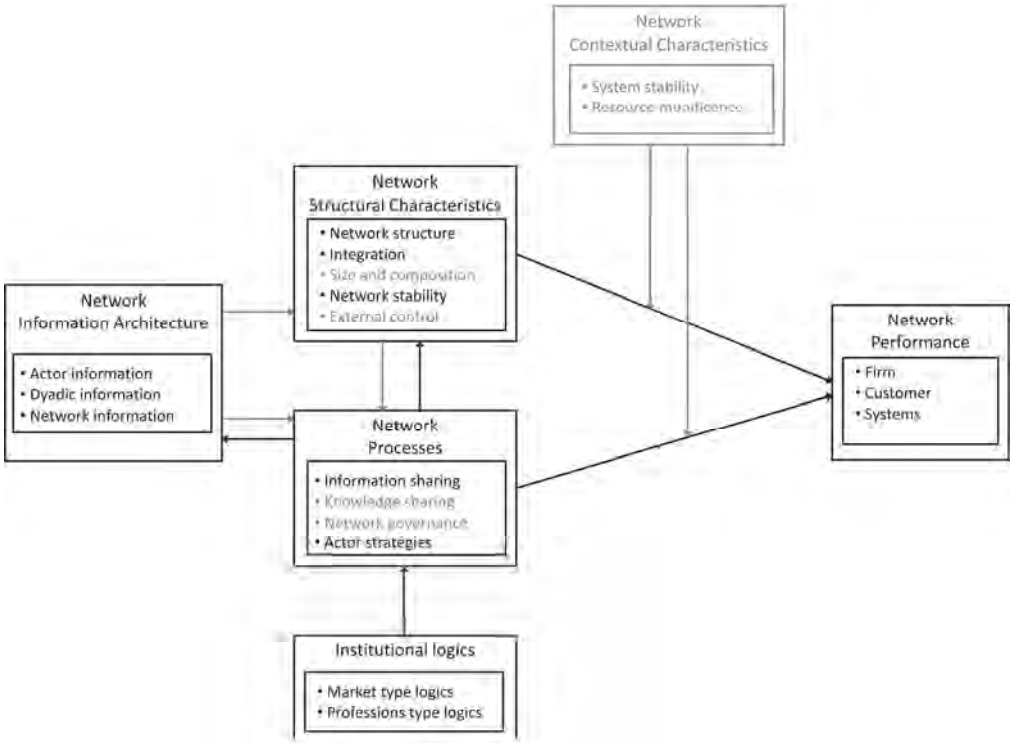


Figure 4.5 Part validation/expansion of the integrated framework in this chapter

Institutional Logics

Here we use the comprehensive definition by Thornton and Ocasio (1999 p. 804):

Definition 9: institutional logics *are the socially constructed, historical pattern of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality* (Jackall, 1988 p. 112; Friedland and Alford, 1991 p. 243; Thornton and Ocasio, 1999 p. 804).

Institutional logics direct, motivate and legitimate organizational action (Scott et al., 2000) by focusing management's attention on a limited set of issues, problems and solutions consistent with the prevailing institutional logic. We identified two logics in this case study that we will refer to as *business-like road assistance* and *towing professionalism* similar to the logics identified by Reay and Hinings (2005) in the health care. The term "towing" is used in this case because, the origin of road assistance services (towing but also jumpstarts, fuel delivery, flat tire service etc.) lies within the profession of towing and salvage of vehicles (as was mentioned in section 4.2). These two industry level logics belong to different societal level logics or institutional orders (see Thornton, 2004 p. 44). Business-like road assistance is a logic based on the order of markets and to some extent corporations, whereas towing professionalism is a logic that stems from the order of professions. Each order has unique organizing principles, practices and symbols that influence individual and organizational behavior (Thornton et al., 2012) and a unique information architecture. Both logics will be discussed in detail in the next section on institutional change within the field of road assistance. The change is comparable to the transformation that Thornton and Ocasio (1999) found in higher education publishing where the logics shifted from an editorial (professions) to a market focus.

Institutional change

Transformation of an organizational field is characterized by these criteria among others: new rules and governance mechanisms, new relations among actors, modified field boundaries, new actors (or transformed identities of existing actors) and new logics (Scott et al., 2000 p. 24). The following depicts how the field of road assistance underwent profound institutional change, one of the indicators is a shift in institutional logics.

New rules and governance mechanisms: from monopoly to market competition

This criterion deals with changes in the rules that direct the behavior of actors in the field (Scott et al., 2000). Before 1999 each "towing and salvage company" had its own district with all work from all emergency call centers (emergency assistance on the main roads and road assistance on the secondary roads for the distinction see section 4.2 Road assistance figures). Prices were dictated yearly to the emergency call centers by the VBS

("Vereniging van Bergingsspecialisten") the association of towing specialists that all towers were a part of. The prices were transparent and the same for any district in the whole country. The emergency call centers had very little influence on price or on whom they worked with. After a ten year litigation by two towing companies who could not enter the market, the anti-trust regulator in the Netherlands, NMa ("Nederlandse Mededingingsautoriteit") banned the exclusive right of the towers in 1999. The NMa obligated the emergency call centers to assign all work (emergency and road assistance) via tenders (Trouw, 2005; Bridgecraft[66], July 2013). Road assistance companies now had to apply for tenders and compete to obtain work in a district.

Modified field boundaries: from towing to road assistance

When field boundaries are altered, new definitions determine the legitimacy of activities, which actors are legitimate and also which are the more or less central or peripheral players (Scott et al., 2000). With the introduction of tenders, the markets for emergency assistance and road assistance were separated and market competition was introduced to both. Before each road assistant had a monopoly on the district and now every three or five years a road assistant has to tender for contracts in that district. At the time of the introduction of tenders, the demand for road assistance grew through entry by labels such as Route Mobiel and because of an increase of the technology built into cars (more disruptions of that kind). The demand for towing whether for emergency situations or not, shrank by 20% due to safer roads and less drunk driving through public awareness (Transport & Logistiek Nederland, 2011). Road assistance became the core business and a large, if not the main source of income for the former towers. Informants from road assistance companies and an emergency call center call this shift one of the most important developments in the industry. One road assistant describes it as a reversal of the former work division of 80% towing and 20% road assistance. Related to this a new title was given to towers, that of road assistant.

[66] Bridgecraft is the consulting agency that designed and executed the tender process on behalf of the emergency call centers with input from antitrust law specialists De Brauw Blackstone Westbroek (Bridgecraft, July 2013)

New relations among actors: from supplier to buyer dominance

This criterion focuses on modifications in the relational structure of the field (Scott et al., 2000). The secretary from branch association ABNed explains that forty years ago the Dutch citizens used allocate work to the then towers and later the police and an association on behalf of stranded drivers. In the 1980's the emergency call centers became facilitator between drivers and towers and in the 1990's these call centers completely took over the direction in this market. The new work allocation system and the aftermath drastically changed the content and nature of the relations between the road assistants and the call centers. Existing relationships went from supplier dominance to buyer dominance (Cox, 2001). The next statements illustrate the shift in power and rise of conflicts:

"Suddenly the purchasing position of the call centers were turned 180 degrees, because they had the power now. They use to have to work with someone and now they can select." (Road assistant large company)

"They don't come to talk to you...you get a letter that you didn't make it, very impersonal, there you go...there used to be an purchaser, who would sit at the table and said: well you have to do something about the price, otherwise it's not going to work. But then you could, would do anything for that company. Now I feel like…you can demand everything but first pay up..." (Road assistant large company)

"And in that period that the tenders would come, a very fierce battle developed between the road assistants and emergency call centers..since then I have always had a certain image of the call centers...Yes I'm against them, never with them. While before I would call them often, I wanted to do business with them, but they have now become the boss over here...many conflicts have arisen." (Road assistant small company)

Additionally, rivalry was created among road assistants especially between ones in neighboring districts. The identity of neighboring road assistants was transformed from colleague to competitor. After introduction of the tender system, the emergency call centers instigated fierce price competition among road assistants that will be discussed in detail in the following section. This statement describes the before and after situation:

"After '99 things were shaken up and road assistants start to compete, the neighbor is suddenly your main competitor and the neighbor four districts away does not hurt you and is still a good colleague. That's the way it is and it is a pity. So first we had price fixing, which brought stability. Now it's reversed and the prices bring unrest, now we are being played off against each other." (Road assistant medium company)

Large claims by the road assistants with the NMa followed when rules for the tender system were tightened in 2002. This adjustment caused 60 towers to leave the industry and forced down prices for the remaining 130 companies (Trouw, April 2005).

New actors in the field

During institutional transformation new types of individual or collective actors emerge and existing actors may transform their identities (Scott et al., 2000). The shift in focus from towing to road assistance (discussed at modified population boundaries) is a transformation of the identity of the road assistants. They received a new title "road assistant" ("pechhulpverlener" in Dutch) before they were just called towers ("bergers" in Dutch). New organizations also appeared in the road assistance industry after 1999. Around 35 road assistance companies are joined in a cooperation called Coöperatief Transport Europa or CTE with the objective to benefit from economies of scale and to do collective tender registration for road assistance and transport with the emergency call centers (road assistance company "nu" from Table 4.1, July 2013). Moreover, AA-Team a new emergency call center was founded by a former road assistance company that lost a large part of his work after the introduction of the new market mechanism. One of the objectives of the company, is to break through the monopoly of the emergency call centers (AA-team, July 2013).

New logics: the emergence of business-like road assistance

Scott et al. (2000) explains this criterion as a change in the types of ends pursued and/or means-end chains that guide action. Our findings indicate that the introduction of a new market mechanism along with road assistance market growth, ushered in a historical shift in institutional logics. The field had previously been organized by *towing professionalism*, a logic that builds on the history and craft of towers / road assistants. The majority of road assistants are independent family-owned business, "mom and pop stores" as the commercial director of Route Mobiel calls them. Many road assistants we interviewed took over the business from their father, these people engage in road assistance as a

lifestyle and a profession. The source of legitimacy under the towing professionalism logic is the personal expertise and improvisation skills of road assistants to solve breakdown problems and to tow automobiles under various circumstances. Within this logic, the identity of the road assistant is similar to other vocations with responsibilities to the wider public such as physicians (Thornton et al., 2005). The people in this occupation are deeply dedicated to the work, as this owner and manager describes:

"They [towers] love their job so much, if you talk to their wives they will say he loves his job more than me. Working day and night, always the same, always the same. They will always say they are the best and then I compare them to fishermen: they always caught fishes that are "this big". (Road assistant small company)

Exogenous shocks are often catalysts for shifts in institutional logics (Glynn and Lounsbury, 2005). After 1999 the industry was restructured, as can be seen from changes in the rules and governance mechanisms, actors and relations between them and field boundaries. This shock of a new market mechanism and consequent developments, allowed another logics to enter the field. This logic of *business-like road assistance* challenged and altered how road assistants operate, compared to the situation under the incumbent *towing professionalism* logic. These laments from an owner of a company founded in the '80s demonstrate this:

"No, you used to stand together...here..I had to coordinate with 12 cars, sorry 5 towers and myself and then I would look...That one goes there..You come from there so you take those two people...I take two...problem solved...In 20 minutes the road was clear and the people at their destination. You stood together, solved things together. Now there is just one tower who has to solve it himself, go ahead figure it out, be gone in a certain amount of time, take everything to the location of the tower and from there put them into a taxi, or replacement car where possible and tomorrow the stuff will be taken away, done..." (Road assistant small company)

Institutional logics embody different organizing principles that determine how actors carry out their work. The statement above indicates differences related to logics with regard to the autonomy of the road assistant to solve problems and the focus on efficiency in handling service calls.

Towing professionalism versus business-like road assistance

Table 4.4 juxtaposes the indicators we found of the towing professionalism and business-like road assistance logics in terms of the belief systems and associated practices. The table summarizes two different models in terms of the roles and responsibilities, the relation between emergency call centers and road assistance companies and the ways of providing road assistance services.

Table 4.4 Two ideal types of institutional logics in the road assistance industry*

	Towing professionalism	Business-like road assistance
Belief systems (what goals or values are to be pursued within a field)	Road assistance is a profession	Road assistance is a business
	Quality of service is determined by road assistants' ability and expertise	Quality of service is determined by what labels demand and pay for
	Labels, call centers and road assistance companies are partners	Labels, call centers and road assistance companies are buyers and suppliers
	Call center staff are operators	Call center staff are assistants
	Neighboring road assistants are colleagues to each other	Neighboring road assistants are competitors to each other
	Road assistance services should be provided using the skills of road assistants to improvise	Road assistance services should be provided by managing cost and quality
	Overall goal is to provide the best solution for the customer	Overall goal is to provide efficient and effective services
Associated practices (means for pursuing the goals and values)	Service calls are handled based on the order of urgency and through discussion with customers	Service calls are handled within the service level for response times
	Customers are treated in the same manner regardless of the label	Customers are treated according to the specifications in the contracts with the label
	Organizations in the network should freely exchange information with each other	Organizations in the network should exchange information with each other through a broker

* This table uses the structure by Reay and Hinings (2005 p. 358).

The emergency call centers introduced the logic of business-like road assistance to the field. The accompanying principles are market competition, cost efficiency and customer satisfaction. The assumptions of this logic are reflected in this statement by the manager mobility of the emergency call center used by Route Mobiel:

"Well they [labels] can still ask [about dedicated capacity], but they would have to pay a lot of money. Look at the way we organize work, the efficiency that we ourselves to bring in, and therefore how much money you eventually have. There you have it, that's really all. If you as a client would say, well I want to have a dedicated team for just my calls then it would cost you triple." (Manager Mobility large emergency call center)

Under the towing professions logic, road assistants use their expertise to find the best solution to the breakdown problems of automobile drivers. Organizing work under this logic would mean that road assistants are at liberty to handle the service calls according to their judgment and professional knowledge as the next statements exemplify:

"...the craft itself, the people, the solutions to situations. Any situation is different, that is the charm in it..." (Road assistant small company)

"Look, I am a technician. I am really annoyed if the car cannot drive. I prefer to tinker 1.5 hours on the car, even if I only get 6 tens [60 euro] for it. I care more about that and that's what you communicate to the boys as well. They then also feel like this, because the staff follows the boss. And yes, I think that's much more important than those few cents. Anything so that man or woman can be on their way" (Road assistant small company)

When multiple logics exist, rivalry is inherent (Scott, 1994) since each logic is associated with different organizing principles and each requires a different set of behaviors from organizations and individuals (Reay and Hinings, 2009). Moreover, Thornton (2002) stated that the professions embody logics that are antithetical to the logics embodied by corporations and markets. The emergency call centers came into the position to impose the challenging logic, which puts rising pressure on the road assistants to organize and operate according to a business-like road assistance logic:

"Most towing companies have sprung from hobbyism, pure hobbyists, who love their profession so much that they find it the most beautiful thing there is, towage and all that stuff. And who have taken long, after the NMa, after that thing with competition regulation, to become business minded. Also a few disappeared because they kept being hobbyists and did not make it financially." (Road assistant small company)

Furthermore Route Mobiel itself is guided by the business-like road assistance logic with disagreement on one element in the belief system. Route Mobiel views and acts as if the road assistance companies and labels are its partners. Since these partners represent Route Mobiel towards the customer, the firm aims to build its competitive position by committing its network to itself. Nonetheless the incumbent towing professionalism logic was not eliminated, the choices and behavior of the road assistants show that they do not accept the new logic. In fact, there is a co-existence of both logics much like the Alberta healthcare system studied by Reay and Hinings (2005) who use the terms "uneasy truce" or "battlefield". As we will see, both logics continue to guide organizational and individual behavior in road assistance with ultimately implications for performance on network level.

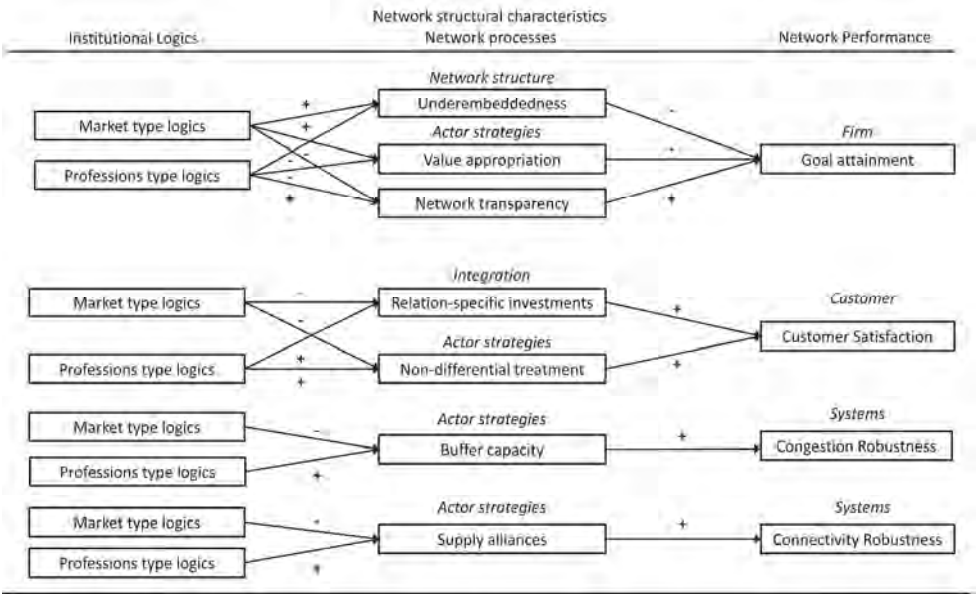


Figure 4.6 Conceptual model

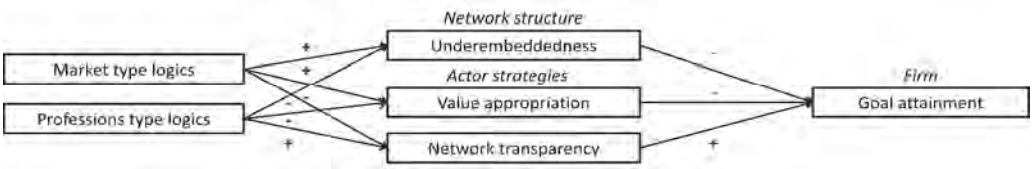
To conclude, we find that there are conflicting logics in the field of road assistance. Conflicting logics imply contradictory conceptions among and sometimes within actors about the goals to pursue and which means to use. Accordingly, our findings show that logics derived from the distinct institutional orders of professions one the one hand and

markets on the other, have large and contradictory impacts on collective performance through the behavior of individual organizations and the resulting network structural and functioning characteristics. Based on these findings, the conceptual model in Figure 4.6 was developed. We will next explicate each theoretical mechanism.

4.6.1 The firm lens

Since the largest part of the network are the road assistants, the discussion of explaining network performance through the firm lens will center on these firms. Our findings indicate that logics derived from the institutional order of markets and logics derived from the order of professions, have opposing effects on goal attainment via underembeddedness, value appropriation and network information architecture in business networks. Market type logics guide actors to develop underembedded ties, encourage value appropriation and decrease transparency of the network through more competitive information strategies while professions type logics direct actors to cultivate embedded ties, curb value appropriation and increase network transparency through more cooperative information strategies. When looking through this lens, the influence of the market type logics dominates, which explains the low level of goal attainment in this network that was established at section 4.5.

Conflicting logics, underembeddedness and goal attainment



For institutional logics permeated with the ideal type of a market logic, the basis of norms is self-interest and the basis of strategy is increasing the efficiency and profit of transactions (Thornton, 2004 p. 44; Thornton et al., 2012). Owen-Smith and Powell (2008)

discuss and illustrate how dominant logics determine the shape and effects of structures in networks. In our case market developments put the emergency call center in the position of network architect and judge (Hinterhuber, 2002 p. 620). In other words, the emergency call center selects and eliminates members of the network and monitors and enforces performance standards. The power of this position is enhanced by the other labels that collaborate with the call center and the low number of alternative call centers road assistants can work for. First of all, it is the emergency call center as a whole so all labels behind it and not just one in particular, that matter for the revenue and profit of road assistants. Road assistants have one contract, price and service level agreement for all labels of an emergency call center, so once they are hired by the call center for a district they receive all service calls of the label partners of that call center. Once they lose the contract, they immediately lose the work from all labels partnered with that call center. Second, the market is an oligopoly since there are only four emergency call centers that purchase services from the road assistants. In this position of network architect and judge, the emergency call center thus has a great influence on shaping the ties in the network. As we will see, the findings indicate that underembedded relations prevail between the firms in the Route Mobiel network and in the wider industry.

Underembedded (or arm's length) relationships and embedded relationships represent opposites on the exchange continuum. With underembedded ties information on price alone is sufficient for making exchanges and actors switch to new buyers or sellers on a regular basis for immediate gains such as maximizing on prices (Uzzi, 1997). As in markets, the relationships between buyers and sellers are cool and impersonal (Lazonick, 1991; Uzzi, 1996). As such, underembedded relationships are characterized by a short term orientation (Ganesan, 1994) of the connected firms and a lack of relationship commitment (Morgan and Hunt, 1994). A short term orientation is "a firm's reliance on the efficiencies of market exchanges to maximize its profits in a transaction as opposed to relational exchanges to maximize profits over a series of transactions" (Ganesan, 1994 p. 3). Commitment has been defined as "belief that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it" (Morgan and Hunt, 1994 p. 23). Contrary to embedded ties, underembedded ties imply a favor towards maximizing short-term benefits over long-term value creation with network partners. The following

depicts the underembeddedness of the relations in the Route Mobiel network. The short term-orientation and lack of commitment in the relations are indicated by large non-shared investments, low continuity and price maximizing by the emergency call center.

Focus on price, low continuity and high investments

Road assistants experience a strong focus on price and lack of continuity in their relations with all emergency call centers. In every single interview with the road assistants and branch associations, this emphasis on price was brought up. Current contracts by the emergency call center of Route Mobiel and road assistance companies will run for five years but also three year contracts have been signed. These contracts are never automatically prolonged. After the contract expires, a new round of tenders follows. An informant of this call center says that with some road assistants there can be collaboration for longer period of time, for the larger road assistants this has been the case for the past ten years.

On the side of the road assistants the feelings of having continuity with this call center are therefore mixed. One manager of a large company feels that while the call center focuses on both quality and price, getting the contract also strongly depends on the relation with the purchasing manager of the call center. Three road assistants from one large and two medium companies comment that in their experience the call center looks at the "history the company built" or "chooses partnership" and "values their partners". Two others again from large and small companies have different experiences with tenders. They explained that because of the heavy emphasis on price instead of quality there is no continuity and that road assistants face a great deal of uncertainty:

"They just look at who's the cheapest and that is pretty tough, because uh yes it is three years and that is much too short...Well, I think that..and every entrepreneur, every road assistant would agree with this, that you cannot invest on it. Three years is nothing. And then, after three years you are told, you've scored a 10, you have good response times, good repair rates, no complaints, you name it, all in order, but you're too expensive." (Road assistant large company)

"Contract is finished and I no longer get the work. Then I asked them kindly if they wanted to take over two of my men and two cars from me. You make an investment and then suddenly it's done...No, no continuity. That is of course each time the same...It is investing with uncertainty, what will happen after three years?...Very uncertain and the problem is too, that I think you are not being judged on your..the quality of your work..you are being judged on money. That is when I sad bluntly to Route Mobiel:...You only look at the dough." (Road assistant small company)

We found there are other indicators of the short-term orientation of the emergency call center in its relations with road assistants (that will be discussed later on) such as asymmetric relation-specific investments and the absence of value sharing. Therefore the ongoing collaboration that some road assistants experience, may have more to do with self-interest than wilful commitment or altruistic attachment (Macneil, 1978; Uzzi, 1997). To clarify, the medium and large road assistance companies generally can offer a lower price than the smaller ones due to economies of scale. If there are only small competitors (or none) for their districts every tender round, these firms can be selected on a regular basis by the emergency call center.

These statements above show that road assistance companies need to make substantial investments in their fleet, equipment and professionals. However, road assistants reveal that investment costs are never shared and nor is there any guarantee that investments will be recovered through future collaboration with the emergency call center not even after adequate performance. As an aside, obtaining bank loans for these investments is very difficult for road assistants because of the short span of contracts in the industry. Moreover, the mix of large non-shared investments and low continuity means that the road assistants risk high opportunity costs related to human asset and physical asset specificity (Williamson, 1985) when contracts are not renewed. A manager explains this predicament:

"I have little over two million worth in vehicles, with all equipment and everything. Well you register for three years and then after three years you don't know if you'll have it. The expensive training of your mechanics and everything..and then it's gone. Then you can sell your stuff. What is it worth? These are all specialist materials, you need to be lucky that the one who got the work will take these over…If you have to train a crew again, you'll get a bunch of mistakes...good people are hard to find...it is easier to be a house doctor than an A level mechanic...and these guys have to continue education until 65 to keep up...well and after three years they say bye bye. And then other firms can start again." (Road assistant small company)

This statement shows that being part of the Route Mobiel network can hinder the attainment of goals for profit but also performance quality through the low continuity of relations. Furthermore in order to compete in the tender that the emergency call center partner of Route Mobiel holds, road assistants need to make a number of additional required investments upfront: certain fleet composition, certified truck fleet, certified mechanics, certified communications training for all employees, board computers (GPS), electronic sending and receiving of service calls (XML). New criteria such as an arrival time registration system ("aanrijdtijdenregistratiesysteem") and electronic invoicing system are put in the contract as mandatory to invest in and adjust to within a certain period of time, if the call center starts utilizing such systems. Every tender round these demands[67] increase according to the road assistants often with a need for more investments that raise their costs. Tender documents with these requirements can be as extensive as 130 pages (ABNed Nieuwsbrief, 2012). Recent additions into contracts by call centers are certificates for road assistance for electronic vehicles and sustainable transport. Meeting these requirements are no guarantee of winning the tender but not complying with these in a bid, takes a company out of the competition to begin with:

"The emergency call centers have the power and they say: I want you to do it this way and if you don't, then I'll find someone else. And that is a science, I don't like this anymore." (Road assistant large company)

These additional investments are thus a prerequisite for being part of the network. However as said, costs of investment are never shared between the road assistance companies and the emergency call center, nor are investments a guarantee that the relation will be prolonged beyond the current contract period.

All these conditions that road assistants face, focus on price, lack of continuity, large investments, uncertainty, have changed their attitude towards all emergency call centers from collaborative towards antagonistic. Statements seen earlier at the beginning of this section on new relations among actors showed that trust in the emergency call center of Route Mobiel has been diminished: "I'm against them, never with them. While before I would call them often, I wanted to do business with them" and "then you could, would do

[67] There are also basic demands for company office (e.g. having a 24 hours service, operative phone and internet connection with e-mail address) and being able to arrange a replacement car for customers.

anything for that company. Now I feel like…you can demand everything but first pay up...” This type of trust is termed benevolence-based trust which is “the extent to which the call center is believed to want to do good for the road assistant aside from an egocentric profit motive (Mayer et al., 1995)”.

Several road assistants commented that right after the introduction of the current market mechanism the relation with purchasers of call centers was more personal than now. Purchasers would visit the road assistance companies often to discuss tender submissions to work out deals. Now, communication such as the result of the tender submission mostly occurs via letter. This resembles the institutional change and accompanying shift from “relationship buying” to “numbers buying” in the apparel industry that Uzzi (1997, p. 58) observed. He found that embedded ties between retailers and manufacturers were destabilized by acquisitions and replaced by impersonal market exchanges. Here the road assistants explain how their relationships have changed from more long-term cooperative ties to adversarial market relations. The next quotes describe in detail how their commitment and goodwill towards the relationship is frustrated by this:

“No, and the result is that as an entrepreneur you are increasingly becoming uncaring towards the call centers, because if that one sits at the table and says: gee you know what we thought up now, not 20 minutes but 15 [about response times]. Then I’ll go: you know what, go figure it out. Because my entire commitment, or what I want to do for such a client is gone because you only get three years, three years you can really do your best and in those three years you can make up everything to dress up and improve the product, but after three years you get the door slammed in your face: you know what you are, too expensive, go figure. Well that…horrible, frustrates of course very much, you cannot build a long term relation like this.” (Road assistant large company)

“That is the downside of tenders, because you have contracts of three years..how do you say, the basis of trust changes drastically. You use to have a client and if you were good for him, he was good for you. But now after three years you become a number and he does not care at all whether you did your job right or not.” (Road assistant medium company)

The intention of the road assistants to maintain and contribute to the relationship with the call centers is clearly seen here. In the discussion of the customer lens we will see that some road assistants even commit to training the staff of the emergency call center. These are relation-specific investments which usually are not made in underembedded or arm’s

length relations (Williamson, 1985; Dyer and Singh, 1998). The new tender criteria can also be considered as relation-specific investments but in that case the dependence asymmetry between the road assistance companies and call center forces them to make these (Gulati and Sytch, 2007). The investments of training are however a voluntary initiative from these road assistants themselves.

We interviewed a former road assistant who founded a new type of emergency call center in 2004. This AA-team intends to immediately put through calls to road assistants via a platform. In this business model AA-team or its clients such as auto repair shops[68] can select the road assistance companies for their customers instead of emergency call centers. All road assistance companies can join and more than one road assistant can operate in the same district. When asked about the motivation to start AA-Team, the founder explained that he saw there was no continuity of business. He too emphasized the focus on price and minor price differences, rather than quality:

"Even if you do your best you know, you can take two hours try your hardest to repair and do that for three years and then the next tender comes and you say well: well I have repaired all the cars and for those 70 euros have done everything, worked for two hours. And they say: what does your roadside assistance cost? Then you say: well 70 euro. Then your neighbour says: 69.50. And then it's goodbye. So the guarantee for that reward is no longer that you have continuity of the work." (Small emergency call center)

The findings in this section show the short-term orientation and lack of commitment of the emergency call center through its price maximizing and switching behavior and recurring demands for large, unilateral investments. Substantial investments are required for obtaining and keeping work as a road assistance company. Renewal of contracts after expiration is not automatic, even if performance has been sufficient. The short span of contracts and low continuity make it difficult to carry investment costs. The negative consequences for goal attainment of profit and performance quality of the road assistance companies can be directly linked to the type of ties that the emergency call center chooses to make.

[68] Many road assistance companies also have a auto repair shops with their customers. They can sell the AA-team passes to their clients and have their own number with AA-team to receive these service calls on against an annual fee.

Upstream with regard to its labels, the emergency call center also creates market type relations with the same service level agreement for all labels and the same network of road assistance companies. As an exception, Route Mobiel has been able to distinguish their relation to the call center through various demands. Since 2010 Route Mobiel now has a specific service level agreement, input in the road assistance company selection process and is present at the advisory board meetings between the call center and a selection of road assistants. It is Route Mobiel's objective to commit the partners in its network to itself because these companies represent the brand towards customers during service provision. Other labels have no such arrangements in their relations with the emergency call center. These demands are only met because Route Mobiel is a large client that accounts for one third of the service calls for road assistance at the call center.

Uzzi (1997) theorized on how the use of embedded ties to link to partners has network-level effects such as reaching integrative instead of distributive agreements and Pareto-improved solutions to coordination problems. This means that in embedded relations partnered firms cooperate strategically to find mutually beneficial solutions and fairly distribute positive and negative outcomes. Goal attainment of firms in networks composed of embedded relations would therefore be higher compared to those consisting of arm's length relations. The Route Mobiel network has become an underembedded or arm's length network because of the logic followed by a powerful organization in the network. We found that the more market type as opposed to professions type logics guide the organizations in a business network, the more the relations will move from the embedded to the arm's length side of the exchange continuum (Uzzi, 1997) and as a consequence goal attainment in the network will suffer, therefore we propose:

Proposition 12: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be through the development of underembedded as opposed to embedded ties and vice versa.*

Conflicting logics, value appropriation and goal attainment

With logics under the cornerstone institution of professions, the basis of strategy is increasing personal reputation and quality of craft whereas under the cornerstone institution of markets, it is increasing the efficiency and profit of transactions (Thornton, 2004; Thornton et al., 2012). In the road assistance industry there is a dependence asymmetry between the road assistants and the call centers. The lack of alternative buyers puts the call centers in a position of relative power (Emerson, 1962). This dependence is asymmetric because for the emergency call center switching costs are low and the services are undifferentiated and standardized (as long as there are multiple road assistants per district). Therefore the call center can discontinue and establish relations easily. The more powerful a party is, the more it can determine more favorable terms of trade and divert profit from the less powerful party (Ganesan, 1994). For references to this argument of value appropriation cf. Gulati and Sytch (2007, p. 36) where they say that "the performance benefits of the stronger, dependence advantaged firm are expected to come at the expense of the weaker dependence-disadvantaged partner." Powerful buyers such as the emergency call centers can capture more value by using their clout to force down prices, demand better quality or more service which drives up costs and play industry participants such as the road assistants off against one another, eroding industry profitability (and also for this network) in the process (Porter, 2008). The pressure on prices, increasing demands for investments and lack of cost, risk and benefit sharing are all indicators of the value appropriation by the emergency call center in the Route Mobiel network.

Pressure on prices

In this case we found that a downward pressure on prices is being exerted by all of the emergency call centers on road assistance companies' tender offers. In many interviews with the road assistants and both interviews with branch associations, this pressure on prices was brought up. Terms are used such as "price driven", "cheapest wins" and "playing hard ball". However, there is some variation among the emergency call centers, three of them including the one working with Route Mobiel are considered to also focus on

quality and history of service. One road assistant remarked that since the introduction of the tender system in 1999, the road assistants have been driving below the price of 1986. In general all emergency call centers squeeze the profits of the road assistance companies they work with. The next quotes describe how the compensation received from all emergency call centers neither covers the operating nor the fixed costs of road assistants:

"There is a norm of 1,5 hours but with road assistance, if a car is not repaired, there is usually always a follow up with arranging a replacement car...etc. The, time and what we spend on the roadside assistance... was simply no longer being compensated by the price. That was just absolutely inadequate...With roadside assistance, you sometimes spend 2, 2,5 hours instead of 1.5 hours. There is no limit to that..and you are working for a price of one third or sometimes less of what you would get for towage [for other clients]." (Road assistant medium company)

"It's not like they say, you have 26 cars…that cost 26 times...we compensate you for it, put it in the tender price." (Road assistant large company)

Furthermore, since the new work allocation system fierce price competition between the road assistants is ongoing. This has been triggered by all emergency call centers that stand to benefit from it. Three road assistants of various sizes describe this phenomenon:

"And the road assistants are driving each other mad with prices, we do it just as them because in the end you go along with the market forces." (Road assistant small company)

"They all try to undercut each others' prices. It's price fighting. Because this benefits the emergency call center, because it's cheaper for them. That is nowadays the trend. You can do all the work for everybody, but you have to do it cheaper. Really you are not allowed to make any money anymore in this society." (Road assistant medium company)

"...a lot of road assistants have gotten into trouble by such practices...they [call centers] have pitted us road assistants against each other, the other side is that we let ehm...there are still road assistants who feel they have to compete against each other. And I say: guys if we unite and one day tell all the call centers to behave or we do nothing anymore, then the Netherlands will be a mess...because they forget that we are an important link in mobility in the Netherlands... not that I would want this to happen, but fighting against each other this way, of course does not work either. The only one who benefits are those parties [call centers] who say: if they are fighting, their prices will only decrease."(Road assistant small company)

The secretary of branch association ABNed tells that road assistants are forced to go along with this cutthroat competition and that there are firms that are working for a quarter of the

price that covers their costs. Decreasing prices form barriers in achieving the operational goals of road assistants in the network especially considering these prices are combined with low continuity. This came across in previous quotes such as "you cannot invest on it. Three years is nothing." A road assistant of Route Mobiel was quoted in a trade publication that the contracts in the industry are too short for sound investment and innovation (Transport & Logistiek, 2011). Low prices discourage and prevent road assistants from investing in their mechanics and fleet:

"I can go for €60 but also for €70. If I have to go real low, then I cannot put an A level mechanic on everything. And then there cannot always be a good diagnosis. Then one in ten will be an error." (Road assistant medium company)

"Look as a contractor you are responsible for maintaining a price-quality balance. And to make sure that a road assistant cannot only do the work, but that he can also invest in education, equipment, to say in the future. Because having expectations is really nice, but at this point the revenues have developed in such a way that you…you simply cannot invest any more… We are all operating on a break-even point…You want to develop yourself." (Road assistant medium company)

The president of branch association VBS confirms that all road assistants deliver quality but that room for investment in top specialists is hardly there for them. Road assistants are advised by this association to carefully consider their prices as to enable continuity of their business and innovation, however clients (i.e. labels and call centers) should then also be willing to cover these costs. Unfortunately, as the president of VBS says by using exactly the same figure of speech as the road assistants: "right now clients are satisfied with a 7 or 8". The quality of their craft is a focus point for the road assistants, however despite this willingness to offer more in terms of quality of the service, the low price levels and continuity make it very difficult, if not impossible to do so. In the short and long run, these conditions can hollow out the network in terms of its performance quality. The secretary of a branch association expresses his concern for this. Road assistance companies are forced to tender for more districts to survive. Emergency call centers are sometimes putting lowest price road assistance companies in charge of five districts. This means that competing companies in those districts lose work and some of them will have to exit the industry. Moreover, the remaining company has to serve a much larger area which makes difficult at the very least to maintain the 30 minute response time for service calls.

Increasing demands and lack of cost, risk and benefit sharing

The increasing demands and related investments by road assistants for competing in tenders were discussed in the previous section. These investments are asymmetric which means that the road assistance companies carry the full cost. This is one of the reasons why the switching costs of the emergency call center are low. Incorporating the investment costs into the prices of road assistance is difficult because of the intense competition. The emergency call center however derives value from such investments through improved service quality or efficiency and therefore a relatively better competitive position for obtaining contracts with labels. An example is the electronic sending and receiving of service calls (XML) which relieves telephone lines and can improve accuracy and speed of service. Since there is no shared investment, these benefits are gained by the call center without carrying any of the costs. This can be seen as a form of value slippage where the party creating the value does not retain all the new value that is created (Lepak et al., 2007). As a side note, it is noteworthy that while the emergency call center demands unilateral relation-specific investments from its road assistants, in its relations with its own customers the labels, the call center does not want to make any investments such as dedicated staff without compensation. Recall the quote from before: "Well they [labels] can still ask [about dedicated capacity], but they would have to pay a lot of money."
Moreover, fuel clause adjustments[69] are never incorporated in the contract, which means that changes in fuel prices such as rises are not compensated. Since there is an absence of such clauses, high diesel prices have a strong impact on financial results in the road assistance industry (Transport & Logistiek, 2011). Finally, between the road assistance companies and the emergency call center of Route Mobiel, profit or risk sharing mechanisms do not seem to exist[70]. There are no benefit sharing arrangements between the emergency call center used by Route Mobiel and the road assistance companies. Another call center does have an arrangement where its road assistants receive plus 25% of the paid

[69] Such a clause would allow for adjustments in the price paid by the emergency call center to the road assistant whenever the price of fuel deviates from some fixed base price.

[70] It is more likely for the opposite to occur in this industry. On the tender registration forms by emergency call centers road assistants can indicate any amount of discount they are willing to give in their tender submission to make it more attractive. There are different constructions such as when a certain level of revenues is reached or higher percentage if more districts are assigned, etc. The call center of Route Mobiel however does not require any discount.

fee if they manage to repair the car and minus 25% if they cannot. This because when cars are repaired, follow up costs such as replacements cars and transport of the broken down car are saved. This is a form of revenue and cost sharing. The call center of Route Mobiel does not have such a performance incentive with its road assistance companies. However, in its own service level agreement with label Route Mobiel, it does have such a bonus/malus arrangement based on its own performance for waiting times, customer satisfaction measured through surveys and also the repair rates of the road assistants. If these performances deviate from established service levels, the call center respectively receives or loses a percentage of the revenue for that month either as reward or penalty.

The findings above show that the market type logic leads the call center to have a short term focus on the relationship with road assistants and to appropriate value from these ties through forcing down prices, increasing demands and the absence of benefit, risk and cost sharing. This prevents road assistance companies from reaching their goals for profit and also performance quality. The relationships between them do not display reciprocity but rather large sacrifices and commitments on the part of the road assistants.

Overall, the emergency call center tends to consider the road assistants not as part of their organization but rather as parts of the external market (Lorenzoni and Baden-Fuller, 1995; Hinterhuber, 2002). The call center aggressively leverages its suppliers as to capture maximum value for itself (Cox, 1999). Iansiti and Levien (2004a) termed this the landlord strategy where hub firms extract so much value from the ecosystem that they make the business models of the needed niche firms unstable in the long run. We also saw that the call center does not share benefits with the road assistants. Incentives are already aligned (Narayanan and Raman, 2004) because the road assistants are highly dependent on the contract with the emergency call center. They have a strong incentive to meet service levels for repair rates without any performance arrangement because they risk losing this contract to a competitor before the end of the term.

Under the professions type logic prices for road assistance would indeed be higher than now, the emergency call center and / or Route Mobiel would have to accept lower margins. However, organizational actors who are guided by the professions type logics as opposed to market type logics, do not view road assistance as a commercial activity. These actors

are thus less motivated by self-interest and profit seeking (see Thornton et al., 2005). Their main focus is on improving their craft and thereby the quality of services and products for end-customers. Such organizations will pass more value to other organizations in the network either indirectly by benefiting end-customers or directly by capturing less value for themselves. On the other hand, when the organizations in a network are directed by a market type logic, these will maximize their interests at the expense of the other organizations thereby lowering goal attainment in the network. Therefore we propose:

Proposition 13: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be through value appropriation as opposed to value sharing and vice versa.*

Conflicting logics, network information architecture and goal attainment

Arm's length relations are characterized by minimal information exchange (Dyer and Singh, 1998). Findings show indeed that the transparency of the Route Mobiel network is low, this is due to the competitive information strategy of the emergency call center. Competitive information strategies focused on segregating information in a subnetwork aim to achieve maximal network centrality for the firms in question, such strategies can lead to vertex covers or star shaped networks (Moldoveanu et al., 2003a). These authors define a competitive information strategy as: "aims to at manipulating the distribution of information within the network to create informational asymmetries between itself and other firms, and also between other individual firms, to increase the dependence of other firms on the distributor, as a source of information." In the road assistance industry the networks are centralized around the emergency call center such as in Figure 4.2. The emergency call center of Route Mobiel connects the road assistance labels and the road assistance companies. There are no direct ties between the road assistance labels and companies. Every new label that enters the market and links to the emergency call center can be seen as strengthening of the bridging position of that firm. It increases the bargaining power of the call center towards road assistants because it can provide access to more work but also vis-à-vis other labels on which the call center becomes less dependent.

The idea behind the newly founded call center AA-Team is to circumvent the emergency call center by directly connecting labels and private customers with road assistance companies. Since the call center is still a small party with relatively few customers, its mission has not been achieved yet.

This bridging position presents the emergency call center with a number of unique information and control benefits. As Burt (1992; 2005) wrote "structural holes are an opportunity to broker the flow of information between people and control the projects that bring together people from opposite sides of the hole." In this industry road assistants are usually not in direct contact with the labels behind call centers. In fact, in the contract with road assistants the emergency call center partner of Route Mobiel has a clause that road assistance companies will refrain from directly contacting the clients of the call center and from providing similar services to these clients. As such the emergency call center intends to keep the network horizons (Van Liere, 2007) of its partners and structural transparency of the business network low.

The emergency call center has an advisory board (in Dutch Raad van Advies) which is composed of a dozen of selected road assistants that meet along with the call center two or three times a year to share ideas to improve processes and services. Before these meetings were held without anybody from Route Mobiel, recently Route Mobiel demanded to be present at these gatherings as well. Still there are never any meetings between Route Mobiel and the road assistants in the absence of the emergency call center. Route Mobiel has neither information on the prices that are paid by the emergency call center partner to road assistance companies nor on the margin of the call center. Maintaining information asymmetry between the road assistance labels and road assistance companies ensures that the emergency call center is able to earn above average margins from its relatively dependent partners (Cox, 1999).

Road assistants on the other hand, despite the nature of the relations with the call center, are still willing to contribute ideas to and share information for improvements in service provision with the emergency call center. The attitudes of the road assistants towards these advisory board meetings are very positive:

"We appreciate being able to give Route Mobiel input so I like that. There is also an Advisory Board at the emergency call center, where discussions are held between people of the call center, Route Mobiel and a select group of road assistants. I'm also asked for it, and we had enjoyable discussions there." (Road assistant large company)

"Recently we were invited at the office of the emergency call center with several other road assistance companies in the Netherlands, about 10 I believe...And had a session where you are talking together. And from such a conversation, you learn things that amaze them and amaze us, but mostly you learn from each other. We need to understand what happens in such a call center or department and what all have to do there. They must learn what we all do. And that is, I found that, I think one of the most positive things that I encountered at meetings and parties of the emergency call centers in recent months." (Road assistant small company)

Competitive and cooperative information strategies lead to different network information architectures. The towing professionalism logic that guides the road assistants induces cooperative information strategies "aims to make a firm's private information, and the importance of this information to the firm's own future actions, common knowledge among other firms in the network or one of its subnetworks" (Moldoveanu et al., 2003a). This is reflected in the statements above but also the relation-specific investment of training call center staff described at the customer lens. This training shows the willingness of road assistants to share information with the emergency call center to assist with quality improvement. Our findings indicate that the emergency call center however, guided by a market type logic, intends to keep the transparency in the network low in order to exploit information asymmetries. This raises transaction costs such as costs related to contracting and monitoring (Dyer, 1996b). Therefore we put forward this proposition:

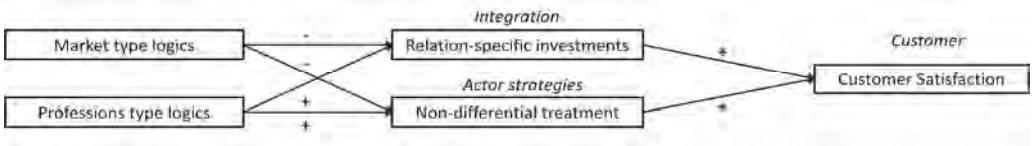
Proposition 14: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be due to lower transparency of the network through competitive as opposed to cooperation information strategies and vice versa.*

4.6.2 The customer lens

When looking through the customer lens we find that logics based on the order of markets and logics based on the order of professions, have contradictory effects on network performance via relation-specific investments and non-differential treatment of customers.

Professions type logics guide actors to make relation-specific investments even under conditions of underembeddedness and spillover rents and promote non-differential treatment of customers while market type logics lead actors to refrain from relation-specific investments in the first place and encourage differential customer treatment. When looking through this lens the influence of the professions type logics dominates, hence the high level of customer satisfaction established at section 4.5.

Conflicting logics, relation-specific investments and customer satisfaction



Before we observed the occurrence of relation-specific investments in the Route Mobiel network despite conditions of underembeddedness. The explanation was the exertion of power by the lead firm in the network, however there are relation-specific investments that are being made in the absence of this coercion. Two road assistants have taken it upon themselves to periodically train new call center agents by visiting the call center with a van or letting them visit their company. One of these road assistants describes this initiative:

"One and half, two years ago, with a colleague we set up a program because with a number of call centers so many new people were being employed...with that friend of mine I have shown a lot of call center agents a number of things, taught them what questions to ask to better find out what is going on...Yes it was driving us crazy. You would hear that something is broken in the front on the left, and then you arrive at the scene and there is something broken in the back...each time we showed groups of eight, ten people just come and see...Do you see lights on your dashboard, when you turn the keys, do you hear something ticking, do you hear the engine rotate? And we also let these people hear sounds so that they can recognize what a customer is indicating. Plus when you know what you are asking and dare to ask, you put a driver at ease. Yes, you know like this you build quality together." (Road assistant small company)

The manager operations of the call center of Route Mobiel said that this training is successful and therefore it is given on a regular basis, every new call center agent has followed it and in half a year when a new group arrives they let them take it. The road

assistants also provide this training to another emergency call center. Training call center staff to handle road assistance service calls is a form of human asset co-specialization (Williamson, 1985). This refers to "transaction-specific know-how which increases as transactors experience working together and accumulate specialized information, language and know-how that helps them to communicate efficiently and effectively" (Dyer, 1996a). This reduces variation and improves the quality of services. This is the case for this training. The customer receives better service if the call center agent is highly capable of probing and uncovering the nature of the breakdown and because of better informed road assistants but also the reassurance that a professional is interacting with him or her. This training is neither initiated by Route Mobiel nor the emergency call center but by the two road assistants themselves. These road assistants invest their time sharing their expertise training call center agents knowing that the improvements will also benefit other firms. For example, competing road assistants operating for the emergency call center or other labels for which they do not work. In contrast, this spillover to competitors and other networks is the primary reason why the manager operations of Route Mobiel refrains, from providing a communications training to all road assistance companies working for Route Mobiel:

"Because everything you invest in roadside assistants, you would also invest for competitors. If I say now: I want you all to do a communications training, then that would benefit our customers, but these road assistance companies will also work for my competitors… in that case.. that's always complicated. We still would like to make that kind of investment, but we can't do entire trainings, because.. you'll take away the advantage…" (Manager Operations Route Mobiel)

The basis of the strategy of professions logics is to increase quality of craft (Thornton, 2004 p. 44). If these road assistance companies were guided by a market type logic, such relation-specific investments would not be made especially not given the outbound spillover rents (Lavie, 2006) even beyond the relations between the call center and the two companies. There are no isolating mechanisms that can prevent the call center staff to preserve the benefits from improved service provision for only the road assistants or specific labels. Value slippage beyond these dyads is inevitable (Lepak et al., 2007). Under a market type logic, this unintended resource leakage benefiting competitors and other labels would then be a strong disincentive to conduct this training. The road assistants would act opposite of what they are doing now. Hence we propose:

Proposition 15: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher customer satisfaction realized by the networks will be by inducing relation-specific investments despite spillover risks as opposed to refraining from relation-specific investments with spillover risks and vice versa.*

Conflicting logics, non-differential treatment and customer satisfaction

With embedded ties, relationship commitment can motivate partnered firms to contribute more to the relation than is literally specified in the contract. With arm's length relations lacking this commitment, target outcomes must be detailed in contracts because there are no incentives to motivate positive contributions afterwards (Uzzi, 1997 p. 51). In their contract with the emergency call center, road assistants agree to provide adequate, efficient, and professional road assistance to Route Mobiel customers within the agreed service levels (30 minutes response times). Road assistance companies could choose to deliver service exactly according to these specifications and nothing more. However, findings show that the road assistance companies are willing to deliver optimal service to each customer. While dependence can be part of the explanation we also learnt some road assistants are motivated by the commitment to their profession. Professional commitment which has been defined as the relative strength of the identification with and involvement in an profession (Aranya et al., 1981; Morrow and Wirth, 1989). Characteristics of professional commitment are the belief in and acceptance of the goals and values of the profession, willingness to exert considerable effort on behalf of the profession and a definite desire to maintain membership in the profession (Porter et al., 1974 p. 604; Aranya et al., 1981 p. 272). At the discussion of the towing professionalism logic we saw this statement already:

"Look, I am a technician. I am really annoyed if the car cannot drive. I prefer to tinker 1.5 hours on the car, even if I only get 6 tens [60 euro] for it. I care more about that and that's what you communicate to the boys as well. They then also feel like this, because the staff follows the boss. And yes, I think that's much more important than those few cents. Anything so that man or woman can be on their way" (Road assistant small company)

Furthermore eight road assistants informed us that for all calls regardless of the label, the ways of working and effort put into it, are the same.

"Look for operations, management, dealing there is no difference for Route Mobiel. Look for us it don't matter squat, yes that is bluntly put, but we don't care whether we go to Route Mobiel or Ditzo, we always want to help the customer optimally." (Road assistant medium company)

"It is not like: well I rather work for that call center because that is..for the road assistance itself it does not matter. Look and that driver or road assistant as you say with a fancy term, yes, could care less. He doesn't know what it pays, he doesn't know, I [manager] know and also not by heart." (Road assistant small company)

"Ehm…well actually it's all the same. Because we are of course willing to deliver the same quality as I do it for Route Mobiel as for Ditzo or whatever. Look there is often a difference in..eh price tag attached and the rights, what are your rights in case it is not fixed or something. And that's where the differences lie. Look I am not going to act differently eh, the same mechanic goes to Ditzo for instance as to Route Mobiel." (Road assistant large company)

"For me it does not matter if I work for Route Mobiel or eh..for Eurocross, because the work is all the same. So I approach the customer the same, provide the same explanation and try to solve it in the same way." (Small road assistant).

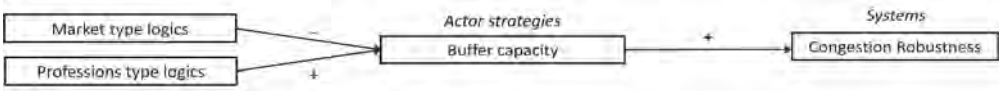
If road assistants would operate fully under a market type logic, they distinguish their services based on the type of customer or service call but they do not. That is the reason customer satisfaction is high in this network. Dependence in itself could be an explanation for this behavior by the road assistants. The findings however indicate that road assistants are not only motivated by dependence but also through a dedication to their craft and a willingness to help stranded automobile drivers. Their dedication to their work does not let them discriminate between customers. This means that the same effort or quality of service is delivered to all customers regardless of the prices or label that the customers belong to or the nature of the breakdown situation and their location. Hence we put forward:

Proposition 16: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher customer satisfaction realized by the networks will be through non-differential treatment and vice versa.*

4.6.3 Systems lens

When evaluating through the systems lens we found that logics based on the order of markets and logics based on the order of professions, have opposing effects on network performance via buffer capacity and supply alliances. Professions type logics guide actors to invest more in buffer capacity and enhance the use of supply alliances while market type logics decrease investments in excess capacity and decrease the use of supply alliances. When looking through this lens the influence of the professions type logics dominates to some extent, hence the medium level of congestion and connectivity robustness established at section 4.5.

Conflicting logics, buffer capacity and congestion robustness



Our findings indicate that it is possible for the emergency call center of Route Mobiel and road assistants to expand capacity through additional resources. For communicating with road assistants (and other suppliers such as car rental companies) the call center has a separate number, so that road assistants do not occupy the telephone lines of customers. Furthermore, the call center requires the use of electronic sending and receiving of calls, especially for reporting back to them. It helps preventing congestion compared to the old situation as the manager of mobility explains. During busy times which can often be anticipated such as the summertime, the call center relies on on-call staff and workers that can log in to the systems and work from home. However, there are never any dedicated call center agents for Route Mobiel as was seen before:

"If you as a client would say, well I want to have a dedicated team for just my calls then it would cost you triple. And now I can say, you are on that "skill" today as we call it at the emergency call center, so you do those jobs. If nothing is coming in for Route Mobiel, then there is probably something coming in for another client and then I want you to answer that. If I only reserve you for that those specific jobs and then you're waiting. And if you're waiting then it costs money." (Manager Mobility Large emergency call center)

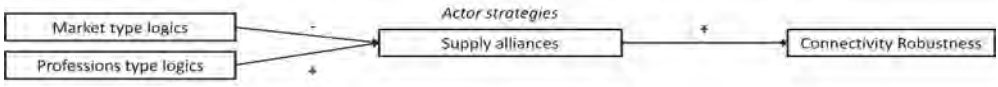
As for the capacity of road assistants, they can use overtime and on-call staff. The large ones generally have several locations which can aid each other. Even the medium and small roadside assistance companies have mechanics working in auto body shops and retired workers that can be called upon. With the small roadside assistance companies it is common for owners and managers pitch in during busy times. However, we also saw in discussing the attainment of performance quality (or operational goals) the lack of room that road assistants have (due to low prices and continuity) to invest in current capacity, let alone expand it. A road assistant commented that before the tender system, they were able to invest in extra capacity in terms of trucks and mechanics:

"…because more money was being made [before tenders]. And the road assistants had money to invest in and have ready additional capacity." (Road assistant small company)

In supply chains, congestion robustness is related to the demand side risks of supply chain vulnerability (Jüttner, 2005; Wagner and Bode, 2007). It has also been termed volume flexibility or the ability to change the output level of services rendered (Beamon, 1999). Since the call center hires one road assistant for each district this can be considered as a case of single sourcing or supplier concentration (Wagner and Bode, 2007) if we include the safetynet agreement with a neighbor. Sole sourcing could pose problems for dealing with inherent demand fluctuations (Tang, 2006). Both call center and road assistants have some excess capacity as was seen. Excess or buffer capacity has been shown to improve supply chain responsiveness (Fisher, 1997). As Kleindorfer and Saad (2005) wrote: "the path to increase robustness includes redundancy and appropriate back-up systems. The old professions logic would allow firms to invest more in buffer capacity for dealing with peaks in demand because efficiency would be deemed less important than guaranteed quality of services. So we propose:

Proposition 17: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher congestion robustness of the networks will be through enabling as opposed to limiting investments in buffer capacity and vice versa.*

Conflicting logics, supply alliances and connectivity robustness



There is of course a limit to any road assistant's capacity. The emergency call center of Route Mobiel hires one road assistant per district, but when a road assistant is unable to meet demand anymore, it is up to this road assistant to solve this. In such cases some roadside assistants have the custom to call upon neighboring companies to aid them. The emergency call center of Route Mobiel is aware that the majority of road assistants rely on neighbours but does not require a backup road assistant in the contract[71]. Nonetheless "safetynet agreements" as they are called, exist[72] between road assistance companies. We refer to these arrangements as supply alliances. Five managers provide insights into the workings of these arrangements before and after the new market mechanism:

"We have with partner companies the agreement that we aid each other...that is the only way I think, cooperation, only it is a pity that after three years you are pitted against each other again. Because then you all have to tender again and if I don't have it because I registered for a low price, but he was lower, then I'll resent him and so that collaboration is again disrupted."(Road assistant large company)

"It is possible, not every neighbor is a good neighbor, but there are also neighbors that understand how it works...So when different road assistants see each other on the road, they will not shake hands but they will help each other when necessary." (Road assistant medium company)

"And difficulty lies in that due to market forces you want to tender for your neighbor's district to lower price on the other hand they [call centers] want you to have a safetynet agreement. That is why you see that people are not being reckless and submitting for everything. As colleagues you should be able to call upon on each other."(Road assistant large company)

"…you should collaborate in times of need, but if everyone holds to that is another matter. Look you can make a certain agreement but in fact if someone does not want let you have that work, then you get, that people don't call you...Back then [before tenders] there was more collaboration, there was no animosity among road assistants because every road assistant had his territory..." (Road assistant small company)

[71] The inclusion of a second road assistant in the contract is demanded by the majority of the other call centers.

[72] This is only allowed if the neighboring road assistant is under contract with the same emergency call center.

"[Can you trust that these parties provide the same services?] *Yes, we have visited each other and those agreements exist. Look you are doing your best for that company for a service, so yes if he does this wrong once, we'll never call him again, it's that simple… Yes well in the towing business everybody knows each other. That was actually something from before, everything is changing now, becoming tougher more business minded…" (Road assistant large company)*

One road assistant explained that his company did not rely on neighboring road assistants because of animosity and being unwilling to help other road assistants. Another road assistant commented that before the tender systems such agreements were natural, he believed that such agreements did not exist anymore. A founder of a new emergency call center and former road assistant adds:

"Before the contracts, that was real collaboration. Now you cannot call your neighbour. And of course you will not call him because he tenders for your region. It is wartime, it is you and I, these are large pieces of the pie of course." (Small emergency call center)

There is one agreement with a neighboring road assistance company. Should the neighbor also be experiencing peaks in demand, then there is no third alternative. This is the case when the cause of high demand, is widespread (i.e. cold winter) then neighboring or even all road assistants will also be occupied. The emergency call center does not keep control over the service call and does not assign a second or third etc. in case the road assistant is backed up and waiting times increase. The practice of calling on colleagues is an additional resource when road assistants of Route Mobiel are faced with demand that they cannot meet by themselves. In case of disruptions one of the strategies that have been proposed is the formation of a supply alliance network. These alliances can serve as a safetynet for each member who will receive help from the other members if a disruption occurs (Tang, 2006). Road assistants rely on such agreements with neighboring road assistants whenever demand exceeds capacity. However, the use of these supply alliances depends on the behavior of road assistance companies when they are called for assistance:

"…look if you have a good colleague you say we find each other, the next time you can help me. But there are some who just push the limits. They register for the same work for a crap price and when you call them once for backup then..eh the price goes up three times. Then you think: ah what are you doing, you know what I won't call you a second time." (Road assistant medium company)

Behavior solely guided by a type of market logics in tendering and handling safetynet agreements would make supply alliances ineffective because competitors would not be willing to aid each other anymore, do a relatively poor job or demand a high price when called upon. Key characteristics of professions type logics on the other hand are relational networks within the profession and personal reputation plus the basis of norms is membership in guild (Thornton, 2004 p. 44). Furthermore the discussion at the customer lens showed that under the towing professionalism logic road assistants do not treat customers differently whether or not the service call was for a competing road assistance company. Based on this we put forward:

Proposition 18: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher connectivity robustness of the networks will be through higher as opposed to lower use of supply alliances and vice versa.*

All the propositions developed in this chapter are visualized once more in Figure 4.6.

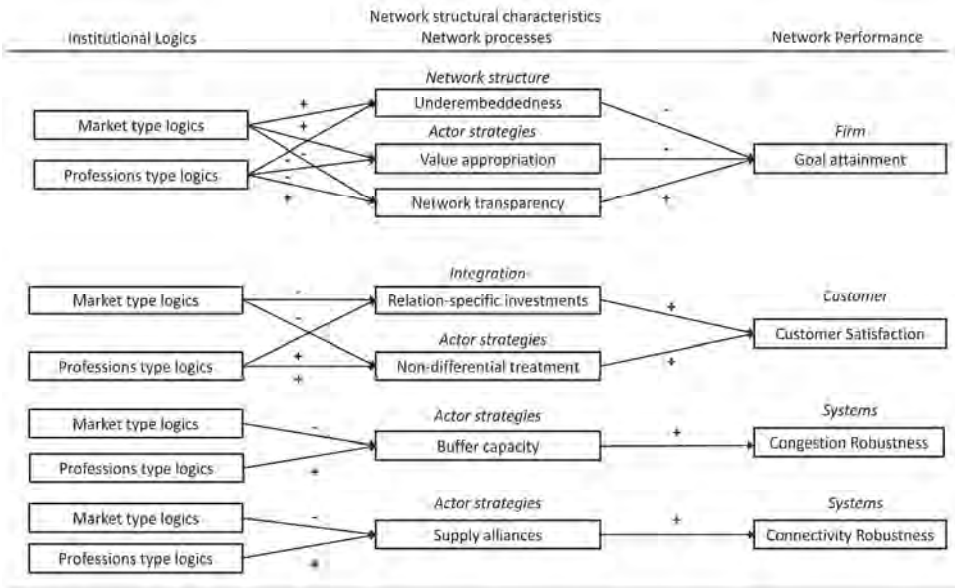


Figure 4.6 Conceptual model

4.7 Discussion

This chapter makes several contributions to the literature. First of all, the explanation of performance of network level had not been studied as comprehensively in the field in any literature stream. We develop a set of theoretical mechanisms, operating at the network level of analysis that describe how institutional logics shape network information architecture, network structural characteristics and network processes. This links neoinstitutional theory to theories and concepts that have been used to explain performance in interorganizational relations such as transaction cost economics and structural embeddedness. Institutional logics are a vein in institutional theory that has focused on explaining organizational and individual behavior, structure and compositions of organizations and fields. As far as the authors know, explaining performance has not been central in studies using this theoretical perspective and for interorganizational networks, so far only implications for the structure of the network have been discussed (Owen-Smith and Powell, 2008).

Second and going into more detail on the mechanisms, we find here that institutional logics are countervailing determinants of network performance through all three lenses. In previous research the co-existence of both types of logics has been compared to an "uneasy truce" (Reay and Hinings, 2005). In this case study we also observe an ongoing tug of war between logics, here the professions type logics sometimes overrules market type logics and vice versa. This is dependent on the power that supports each. With performance through the customer and systems lenses, road assistants have some leeway in their ways of working to keep applying the towing professionalism logic to the benefit of customers. With the firm lens the business-like road assistance logic has the upper hand to the detriment of the firms in the network because the emergency call center has a great influence on shaping the ties in it. We thus found that performance effects are contingent upon the logic that has the greatest influence through the power of actors in the business network. For lead organizations in interorganizational networks, awareness of the logics followed by network partners can mitigate agency problems where it is difficult or costly to verify what the agent is actually doing (Eisenhardt, 1989b). It can also shed more light on where lead organization's and network partners' goals and desires conflict. Institutional

logics (see definition 9) direct and motivate organizational action (Scott et al., 2000) and can therefore help predict the behavior of organizations in the networks. With awareness of (differences and changes in) logics among network partners, lead organizations can structure incentives, inform or control their network more effectively and thereby influence network performance. For other network members awareness of the institutional logics followed by (more) powerful network partners can lead them to reconsider network membership or devise strategies that will help preserve their own logic and allow it to coexist (Reay and Hinings, 2009).

Third and last, the three different levels of performance found in this case are a validation of the lenses. The lenses seem complementary, each of the three lenses seem to be necessary for the evaluation of network performance. When speculating on the optimal performance of the business network in this case, we conclude that neither type of logic should dominate. Professions type logics tend to lead to behavior that harms efficiency while market type logics inspires behavior that can lower customer satisfaction and robustness. The highest level of network performance seems to be achieved when a balance is struck between the two types that simultaneously maximizes goal attainment of the firms in the network over the short and long term, similarly maintains customer satisfaction and leaves room for investments and partnerships to maintain acceptable levels of robustness of the network.

4.8 Conclusion

In this case study of a road assistance business network we developed a conceptual model that explains network performance through the three lenses through the institutional logics that actors in business networks follow. We found that the two different types of logics identified had contradictory effects on network performance through underembeddedness of ties, value appropriation and relation-specific investments by firms, transparency of the business network, non-differential treatment of customers, investments in buffer capacity and the use of supply alliances. The findings in this chapter also validated the three lenses developed in Chapter 2 of this dissertation.

CHAPTER 5 Conclusions

The beginning of this dissertation discussed business networks as a prevailing form of organization. In various industries and sectors multiple, interdependent firms coordinate and combine efforts to deliver products and services to end customers or clients. This proliferation of business networks presses the need to move theoretical development on processes and outcomes forward, beyond actor and dyadic level to the network level of analysis. The objective of this dissertation was therefore to enhance our practical and theoretical understanding of business network performance through conceptualization research, laboratory experiments and a field case study. This chapter contains a summary of the findings including the integrated framework drawn from the three studies, discusses the generalizability and limitations of these findings, elaborates on the theoretical and practical contributions made in this work and finally addresses directions for further network performance research.

5.1 Summary of the findings

We will summarize the main findings of the three studies from Chapters 2, 3 and 4. In this dissertation the central questions formulated in Chapter 1 were: *How can business network performance be conceptualized, validated and measured and what are the main factors that explain business network performance?*

Chapter 2 Conceptualization study

Questions of conceptualization, measurement and explanation were answered here by thoroughly analyzing the extant network performance literature.

First, a clear and precise definition of the networks under study was provided. In this dissertation we focused on business networks that are *consciously created, goal directed, multi-sourcing networks consisting of three or more differentiated, complementary, interdependent but autonomous firms that coordinate for the joint production of products and/or services.* A brief review of the advances on performance in business networks

followed. The literature search for network level performance studies thereafter yielded dearth, in total number of studies as well as diversity in terms of the concepts, definitions and measures used. The selected literature was organized based on performance concept and measure but also on evaluation perspective. These evaluation perspectives or different views on what network performance meant correspond with different dimensions of the concept and led to the introduction of the firm, customer and systems lenses. Each lens was discussed based on its theoretical foundations, key concepts and stakeholders. A definition for network performance resulted from combining all three lenses. Network performance is defined as *the ability of the network to fulfill the objectives of member organizations, provide benefits and recurring value for end customers under multiple conditions including internal and external shocks.*

The next step in the analysis focused on the explanatory studies in the selected literature and identified and categorized drivers of network performance. Based on this categorization and an existing conceptual model for public network effectiveness (Turrini et al., 2009), a preliminary framework was developed with the building blocks: network processes, network structural characteristics, network contextual characteristics and network performance and their (inter)relations. Finally, when further analyzing the network processes consisting of actor strategies, network governance and knowledge and information sharing, we found that the nature and degree of these processes depended on information that was available to organizations in the business network. The concept of network information architecture was introduced which is defined as *the overall level of actor, dyadic and network information that is available to and relevant for the decision making processes and actions of organizations in a business network.* Theoretical arguments were provided for the interrelation between this concept and network processes. Through the observations and findings in this chapter two guidelines for research on interorganizational networks are also presented. The propositions and guidelines developed in Chapter 2 are displayed in Table 5.1

Table 5.1 Propositions and guidelines Chapter 2

Proposition 1: *Network performance is a multi-dimensional construct*
Proposition 2: *Network structural characteristics are, all else being equal, main determinants of network performance*
Proposition 3: Network processes are, all else being equal, main determinants of network performance
Proposition 4: Network structural characteristics are, all else being equal, main determinants of network processes
Proposition 5: *Network processes are, all else being equal, main determinants of network structural characteristics*
Proposition 6: *All else being equal, network contextual characteristics moderate the relation between network structural characteristics and network performance*
Proposition 7: *All else being equal, network contextual characteristics moderate the relation between network processes and network performance*
Proposition 8: *Understanding and influencing the performance of interorganizational networks requires a configurational as opposed to a universal approach.*
Proposition 9: *Network information architecture is, all else being equal, a main determinant of network processes*
Proposition 10: *Network information architecture is, all else being equal, a main determinant of network stability*
Proposition 11: *Network processes are, all else being equal, main determinants of network information architecture*
Guideline 1: *Theory building on interorganizational networks is enhanced by a precise definition of the network under study with specification of: the set of actors, the ties, the nature of the interdependence between organizations and the potential purpose of the network.*
Guideline 2: Theory building regarding network performance in interorganizational networks is enhanced by authors' explicit specification and justification of the lens and performance type of interest: firm, customer or systems.

Chapter 3 Laboratory experiments

The question of explanation and measurement were answered in this chapter through laboratory experiments on the relation between network information architecture and network performance via actor strategies and network structure. The laboratory experiments use an environment that is specifically designed to study business network phenomena and that has been calibrated with empirical data. Within the experiments participants operate a firm in the insurance industry and fulfill customer demand for policies through a network of partner firms.

With these experiments we demonstrated the indirect effects of actor, dyadic and network information on network performance through partnering, disintermediation and density strategies. Findings in this chapter are:

- Under conditions of network transparency the overall density of the business network can be increased through partnering strategies which can lead to higher network effectiveness. In the presence of increased information on other firms, dyads and the network, firms can identify more potential partner firms and span ties with these. Firms will also have more information for their competitive responses to the developments in the network. When there are more connections among firms and their capabilities, the network as a whole, can more adequately meet customer demand for a wider variety of products and services.
- Under conditions of network transparency the level of disintermediation in the business network can increase through such actor strategies which can lead to higher network efficiency. In the presence of increased information on other firms, dyads and the network structure, firms will rely less on intermediate partners to fulfill demand because the firms will have more information on the location, prices and capabilities of the other firms. Disintermediation means that there can be an overall lower cost structure because there are fewer costs and margins in the prices of products and services.
- Under conditions of network transparency firms can increasingly adopt operational excellence strategies thereby enhancing the efficiency of the business network. In the presence of increased information on other firms' prices and capabilities, firms will focus on operational efficiency and lower their production costs. Under conditions of price transparency and competition these cost economies will be used to lower the prices of supply in the network and lead to more competitively priced products and services delivered by the network.

Chapter 4 Case study

Questions of measurement, validation and explanation were answered here through a field case study. First is a description of the selected business network from the road assistance industry and how the network possesses the characteristics from the definition provided in

Chapter 2 (i.e. consciously created, goal directed, joint production function, multi-sourcing, differentiated, complementary, interdependent but autonomous firms). Moreover initial research on this network indicated that network performance data would be available. We used the three lenses of network performance (firm, customer and systems) and the concepts of goal attainment, customer satisfaction, connectivity and congestion robustness which were then operationalized by selecting measures that belong to the context of the case. For each of the lenses different levels of network performance were found, suggesting that the lenses capture distinct dimensions of the construct. This supports the notion that the lenses are complementary and that network performance is a multidimensional construct.

We analyzed data from interviews with managers and owners of road assistance companies, emergency call centers and road assistance labels and focused on the behavior of the firms in the network. The analysis showed that the behavior in the business network was directed by two distinct patterns of behavior with different belief systems and related practices, also known as institutional logics. In the case study we identified and termed these logics: *business-like road assistance* and *towing professionalism*. The former logic is based on the order of markets and to some extent corporations, whereas the latter is a logic that is based on the order of professions (Thornton, 2004). Each order has unique organizing principles, practices and symbols that influence individual and organizational behavior (Thornton et al., 2012) including, as is shown, information strategies which leads to different network information architectures. Both logics and their belief systems and practices are detailed after discussing the profound institutional change that the field of road assistance went through. The two market type and professions type logics conflict to a large degree which means that there are contradictory conceptions among the firms in the business network about the goals to pursue and the means to use.

We adopt the three lenses and describe the impact on network performance of these logics through their effects on the behavior of the firms. The impact depends on the lens adopted because the two logics are relatively more or less influential on certain performance concepts. When evaluating network performance through the firm lens, the low level of goal attainment is explained by the relatively stronger influence of the market type logic which increases value appropriation, underembeddeness and competitive information

strategies. When evaluating network performance through the customer lens, the high level of customer satisfaction is explained by the more dominant professions type logics that embody a higher degree of professional commitment and promote relation-specific investments. When evaluating through the systems lens, the professions type logics dominate to some degree, resulting in a medium level of network performance through investments in buffer capacity and more use of supply alliances. Based on these findings we develop theoretical mechanisms on the opposing effects on network performance of market type and professions type logics via actor strategies, (value appropriation, buffer capacity, supply alliances), information sharing and network structural characteristics (underembeddedness, relation-specific investments). The propositions developed in Chapter 4 are displayed in Table 5.2.

Table 5.2 Propositions Chapter 4

Proposition 12: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be through the development of underembedded as opposed to embedded ties and vice versa.*
Proposition 13: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be through value appropriation as opposed to value sharing and vice versa.*
Proposition 14: *All else being equal, the more dominant market type logics as opposed to professions type logics become in business networks, the lower the goal attainment of the organizations will be due to lower network transparency through competitive as opposed to cooperative information strategies and vice versa.*
Proposition 15: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher customer satisfaction realized by the networks will be by inducing relation-specific investments despite spillover risks as opposed to refraining from relation-specific investments with spillover risks and vice versa.*
Proposition 16: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher customer satisfaction realized by the networks will be through a higher degree of professional commitment and vice versa.*
Proposition 17: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher congestion robustness of the networks will be through enabling as opposed to limiting investments in buffer capacity and vice versa.*
Proposition 18: *All else being equal, the more dominant professions type logics as opposed to market type logics become in business networks, the higher connectivity robustness of the networks will be through higher as opposed to lower use of supply alliances and vice versa.*

The next section discusses the contribution to theory of this dissertation.

5.2 Theoretical Contribution

This dissertation research was undertaken to advance theory development within the research area of network performance. Inteorganizational networks continue to have the attention of scholars from a diverse background of management disiciplines making different and valuable contributions. Studying network performance with an interdisciplinary approach therefore seems logical and proves to be fruitful. The work makes three theoretical contributions by closing large gaps in the literature on interorganizational networks. The gaps are closed by bringing together the contributions from disparate literature streams on network performance that shed light on different aspects of both networks and performance and by conducting original work that extends neo-institutional theory and develops an information-based view of network performance.

First, the lack of conceptual clarity on network performance was addressed by structuring and distinguishing between studies on network performance that have used a variety of definitions, concepts and measures. While these studies make separate strides in the literature on public management, supply chain management and strategic management, an integrated research effort was still needed to combine their evaluation perspectives and insights. This resulted in the conceptualization through three different lenses and a comprehensive definition of network performance. Furthermore, the conceptualization was applied and validated in a real life business network case study. The findings from the field supported the distinction of the three lenses and their relevance. Maintaining a tight connection between conceptual constructs and measurable variables as is done here, improves the understanding of a phenomenon (Siggelkow, 2007). This is because the operationalizations of network performance from the firm, customer and systems lenses in the case provide the illustration of the conceptualization in the practical world. Additionnally, it can aid researchers in their thinking about how they would operationalize network performance in the various other contexts and networks that they study. Researchers can use the conceptualization and clarify their approach to studying network performance as a dependent variable. Whether they adopt one or multiple lenses, explicit descriptions of the lens or lenses will enable better comparison and distinction between the findings of studies and the accumulation of knowledge in this area of research.

The second gap relates to the explanation of network performance for which the extant, scarce and diverse literature was organized into categories and factors. Only in the public management literature have such frameworks of network-level categories related to process, structure and context been developed (Provan and Milward, 1995; Turrini et al., 2009). These frameworks are expanded by adding the processes of information sharing, knowledge sharing, network governance[73] and actor strategies. While information sharing and knowledge sharing have been identified as crucial factors for explaining network performance in supply chain management and strategic management (Straub et al., 2004; Dyer and Nobeoka, 2000) these processes are peripheral in the public management literature and its progressive stream on network effectiveness[74].

To clarify, for actor strategies, during the categorization of the concepts from the selected literature, we weighed the competing virtues of parsimony and comprehensiveness (Whetten, 1989). While Turrini et al. (2009) described some specific strategies (e.g. traditional managerial work, generic networking) we choose to add actor strategies as the umbrella process category because the distinction between network governance (steering and strategies by the network leader) and actor strategies (the other organizations in the network) is the most relevant one to make.

Connecting insights from public, supply chain and strategic management closes the gap in the explanation of network performance, however we find in addition that the theoretical mechanisms for the identified processes depend on the availability of information. Drawing on theories on market transparency (e.g. Koppius, 2002; Zhu, 2004), environmental scanning (Choudhury and Sampler, 1997) and interorganizational relations and networks (Van de Ven, 1976; Gulati, 1995) we introduce the concept of network information architecture and discuss its interrelations with network processes and relation to network stability. Information shapes and drives network processes and network stability and therefore indirectly impacts network performance. Information on actor, dyadic and network level plays a critical role in these processes and structural

[73] To clarify, network governance is a central topic in the public management literature on interorganizational networks (e.g. Provan and Kenis, 2008), however it is not part of the frameworks of Provan and Milward (2005) and Turrini et al, 2009).

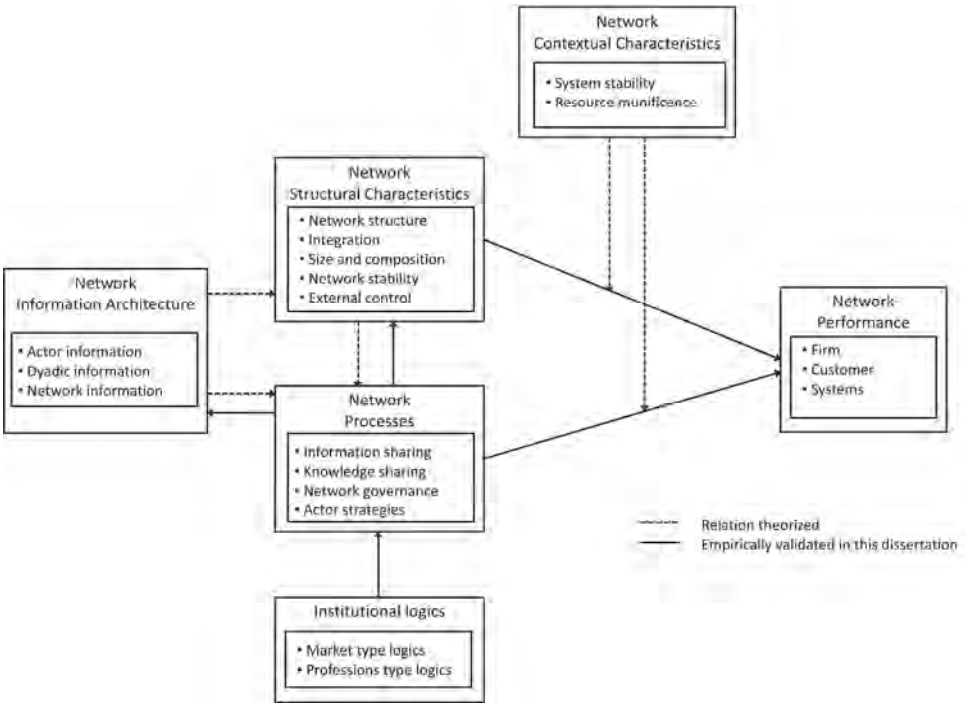
[74] Turrini et al. (2009 p. 546) do discuss knowledge sharing at the end of the paper at the discussion, however it is not part of the framework.

characteristic in networks. In the literature on interorganizational networks this forming influence of information has not come to the forefront in theoretical models yet. Notable exceptions are Moldoveanu et al. (2003ab), Van Liere (2007) and Moldoveanu and Baum (2011). Furthermore, through laboratory experiments we find empirical support for the relation between network information architecture, actor strategies, network structure and network performance.

In the field case study we sought to support and expand the preliminary integrated framework resulting from the previous studies. We adopted an exploratory approach starting from the performance concepts corresponding with the three lenses and then examined the factors that drove performance. We found that the network information architecture, network processes and structural characteristics were strongly influenced by the institutional logics that organizations and individuals in the business network followed. Institutional logics and in particular whichever type prevailed (market or professions type) impacted the level of performance through all three lenses. The third gap is closed by extending neo-institutional theory in multiple ways. While discussed as fruitful (Owen-Smith and Powell, 2008; Thornton and Ocasio, 2008), theory development on institutional logics within interorganizational networks has not yet come underway. The findings in the case study demonstrate the relevance of institutional logics via organizational behavior and network processes. It was already well known that different types of institutional logics lead to different practices and behavior but not how logics influence differences in the willingness to share information and which types of information. Institutional logics have been strongly connected to organizational and individual behavior and consequences for organizational design, structure and fields but the impact on performance or outcome is rarely studied in this vein of the literature.

The new building blocks of network information architecture and institutional logics presented in this work to explain network performance could shed new light on the mechanisms described in previous studies such as Provan and Milward (1995) and Dyer and Nobeoka (2000). The discussion of the Toyota knowledge sharing network showed how mechanisms of information sharing, knowledge sharing, network governance and actor strategies were predicated on information. The relation between knowledge sharing

processes and network performance could have been further understood by examining the type of network information architecture required for the effects found in the Dyer and Nobeoka study. The Provan and Milward study perhaps would have found different effects in the networks of Tucson, Akron, Albuquerque and Providence and their performance depending on the type of prevalent institutional logics guiding mental health agencies and their professionals.



5.1 The information-based view on network performance

To conclude, the framework developed in this dissertation (see Figure 5.1) represents the three main theoretical contributions and displays the information-based view on network performance. This framework is intended to start a research program that will lead to the extension and refinement of network performance theory. The three main lines of inquiry are subsumed under section 5.5 Future Theory Development in Network Performance Research.

5.3 Managerial Contribution

The insights from this dissertation are useful for managers whose organizations are embedded in business networks. We will discuss the three main managerial implications arising from our findings.

First of all, the extant network performance literature and the resulting conceptualization and validation of three lenses suggest that network performance is a multidimensional construct. This implies that the firm, customer and systems lens should all be adopted for performance evaluation and effective network management because these lenses capture different aspects of the construct. We take Route Mobiel from the field case as an example. Currently the company is steering its network based on performance through the customer lens which indicates high performance. However, through the firm and systems lens we observed low and medium network performance. In fact, the strategy and ongoing actions by its partner, the emergency call center has the potential to hollow out the network in terms of its performance quality (through exit of road assistance companies from the network, decreases in buffer capacity and supply alliances). Therefore, evaluation performance through a single or even two lenses can give an incomplete view on how well the network is doing and will be doing in the future. It can mislead managers of organizations operating in networks that their strategic objectives will continue to be obtained. The proliferation of networks in the private and public sector whether these are aimed at winning the competition against other business networks or at maximizing welfare for clients, requires that managers of organizations in these networks need to adequately evaluate network performance. Of course the three lenses introduced here need to be further researched which is discussed in the next section. Current and future insights can ultimately give rise to the development of a network performance scorecard (Kaplan and Norton, 1996) or dashboard that allows for comprehensive evaluation of business network performance. Both practitioners and scholars should analyze and decide through iterations what concepts and measures would be included in the network performance dashboard for which industries and sectors. Examples of supply chain/network measures can be used to select measures for firm and customer lenses. However, for the firm lens measures should also capture to what extent the economic, financial and operational

objectives of the firms in the network (according to definition 2) are being met; and for the systems lens appropriate ex ante or ex post measures should be studied and selected. Future research should also look into the relative weight of each lens and the benchmarks that are part of measures. Contingencies such as the type of governance and developmental stage of the network (Provan and Kenis, 2009) may influence the relative weight of lenses and the type of benchmarks that are appropriate for network performance evaluation.

When a lead or network administrative organization starts using this network performance dashboard for network management, the following related implication is important to take into account. Managers in business networks should be aware that organizing and evaluating are recursively related. Whatever lens, concept and measure is chosen as the main focus of network performance, in practice, when a chosen concept for assessing network performance is being applied, it can influence and be influenced by certain management practices in the network (Sydow and Windeler, 1998).

For network members that are not leading the network, a network performance dashboard could entail monitoring their performance through the firm lens for all the networks they participate in. In the field case, road assistance companies could monitor how well each network that they are a member of is meeting their objectives.

Second, while institutional logics being principles of actors, are difficult to influence or change, the resulting behavior can be monitored and (dis)incentivized by in particular, lead organizations. When lead organizations outsource their business processes and functions to a network of partners, they make themselves vulnerable by not being in full control of operations yet being fully accountable in the eyes of the customer. In the case of Route Mobiel it is even worse because it outsources everything but marketing and customer contracts to the emergency call center and road assistance companies. These other firms are an extension of Route Mobiel and their behavior should be aligned with the values and strategies of Route Mobiel. Being aware of the institutional logics that motivate these parties (Scott et al., 2000) helps to predict their behavior. In general, organizational and individual behavior guided by market type logics will favor efficiency over optimal customer satisfaction whereas professions logics will do the opposite. Given the strong effects of institutional logics on organizational and individual behavior, being aware of the types of logics actors in networks can help solve many principal-agent problems. Those are

problems that arise from when there are conflicts between lead organization's and network partners' goals and desires and it is difficult or costly to verify what the agents are actually doing (Eisenhardt, 1989b). Since logics seem to influence network processes and network structural characteristics to a large extent, it seems vital that managers in business networks are aware of the principles that guide other organizations in the network. With awareness of (differences and changes in) logics among network partners, lead organizations can select (dis)incentives to control the behavior of network partners and inform or control their network more effectively and thereby influence network performance. For other network members awareness of the institutional logics followed by (more) powerful network partners is relevant for their strategies as well. This could lead them to reconsider network membership or develop strategies that will help sustain their own logic and allow it to coexist. For example through collaborations that result in mutually desirable outcomes such as Reay and Hinings (2009) described for the Alberta healthcare field (ibid.). The network of Route Mobiel is operating in a field that is fragmented through conflicts over means and goals between its network partners. Awareness of logics aids firms with their repertoire of response strategies to these conflicting institutional demands (Pache and Santos, 2010). This puts demands on the information architecture of the network.

Third, the determining influence of network information architecture implies that managers of leading organizations in the network should pay attention to how transparent or opaque their network is in terms of actor, dyadic and network information. In the field case we saw that institutional logics influence the type of information strategies in the network (competitive versus cooperative) which in turn, influenced information sharing processes and ultimately network performance through the firm lens. Lead and network administrative organizations benefit to a large extent from a transparent network (see e.g. Dyer and Nobeoka, 2000), an exception to this might be the actor information on the value they appropriate from the network. Awareness of the importance of a transparent business network, can lead these network leaders to invest in interorganizational systems, structure incentives differently or invest in meeting the information needs of network partners that are brokered by other firms. For example to counter competitive information strategies of some network partners. Route Mobiel for instance requires to be present at the advisory

board meetings between the call center and a selection of road assistants. Moreover, it created a customer satisfaction survey platform that captures information on the performance of the road assistance companies and the emergency call center.

5.4 Generalizability and Limitations

In this dissertation we strived to develop a model that is both parsimonious and generalizable to broad contexts of interorganizational networks. Here we will discuss the limitations to each of the studies in this work. In Chapter 2 we characterized the network under study in this dissertation therefore the findings will pertain to networks that are consciously created, goal directed, multi-sourcing networks consisting of three or more complementary, interdependent but autonomous firms that coordinate for the joint production of products and/or services.

Limitations to the conceptualization study

A limitations to the conceptualization study is that while our selection procedure was thorough, relevant studies could have been missed if these were not in the databases we queried or if these used different keywords that we searched with. However, the framework builds strongly of the review of Turrini et al. (2009) and we caution readers that the framework and related propositions are a work-in-progress and await further research for support and validation. For this we provide recommendations for future research.

Limitations to the laboratory experiments

The importance of the network information architecture for network structural characeristics and processes has been discussed in Chapter 2 for interorganizational networks in both the private and public sector. The focus with the experiments in Chapter 3 however, in terms of the specifics of the empirical setting, is on private sector networks.

The findings for the identified transparency effects are therefore restricted to the private sector networks.

The experiments are based on a model of reality therefore it may represent it not completely. However, efforts were made to make it as realistic as possible and to incorporate those elements that are relevant in a business network setting and that correspond with the characteristics of business networks we defined. Although we have attempted to model the industry setting as realistically as possible in our experiments (and validated this to some extent), thus ensuring a higher degree of external validity than is common in most experimental setups, ultimately an experiment like this does remain a stylized environment. As such, there are limitations to the interpretation and generalizability of the results.

For instance, firms in the experiment do not face any decisions regarding production capacity (which is unlimited), service quality and pricing decisions (which are fixed by the experimental setup). This may impact a firm's behavior in the network, which may in turn alter the effects of transparency on network performance. Similarly, there is no entry and exit in the network by firms, yet it may be that networks with high transparency are able to improve their performance over those with low transparency as in the latter case it is much more difficult for a new entrant to get noticed and become integrated into the network. Another potential limitation is that we only focused on actor information (their existence prices and capabilities) and dyads (their existence) and the network structure. Other information cues such as past orders that flowed through a particular dyad, were not included in the experimental setting. While this helped in isolating a clear effects for these types of transparency, it might be that these effects would change by having more or less information on the other cues. Investigating the tradeoffs and synergies among the different types of transparency, awaits further research. Furthermore, transparency level of the network information architecture was captured here through what the average firm in the network could see. With such a crude measure clear effects were shown on network effectiveness and efficiency. Future research should develop and adopt more fine grained measures for actor, dyadic and network structural information in a business network.

Limitations to the case study

Limitations to the case study are that it involved a single case, idiosyncrasies of these case and the setting may have an influence on the findings. However, the opposing influences of market type and professions type logics have been described well in the literature. Our findings will be particularly relevant in business networks where both market type and professions type logics can be found. Prior studies have identified these in the areas of industries that originate around crafts and that have been professionalizing and commercializing such as higher education publishing, architecture and accounting (Thornton et al., 2005). However, the argument of awareness of the types of logics that are prevalent in business networks holds nonetheless, given the implications for organizational and individual behavior and ultimately network performance. Our case in road assistance is a single context which has its limitations, we therefore encourage development and refinement by further research. Our findings can be the basis for hypothesis development and testing in future field studies.

5.5 Future Theory Development in Network Performance

Here we will discuss avenues for future research on network performance. As a nascent area of research there are many lines on inquiry to be followed. However, we take the findings of this dissertation as a starting point and offer directions that we believe will make great strides into network performance theory development.

Network Performance

The conceptualization of network performance offered here requires further inquiry which will not restrict itself to only a few studies. It is likely that scholars specialized in different methods will work on theory development in this area. As discussed with the limitations of the case study, future studies should focus on other business networks in the field to further validate the three lenses on network performance. Future conceptual studies should examine the three lenses and assess the completeness of the typology of key concepts displayed in Table 2.4. These studies should determine which concepts should be included,

so which key concepts should be part of the multidimensional or multilens space (Provan and Kenis, 2009)? There can be contingencies here for the appropriateness of certain performance concepts for evaluation such as the developmental stage in the network and type of governance (ibid.). Such contingencies can lead to a relative weight of each lens when evaluating network performance. This would determine what acceptable levels of overall network performance are under these circumstances. Section 2.6.4 briefly mentions complementarities and performance trade-offs of the three lenses. Future research should also attempt to uncover the relations between the lenses. This can be done by combining mathematical modelling and data from longitudinal case studies which should explore the correlations between the dimensions of network performance.

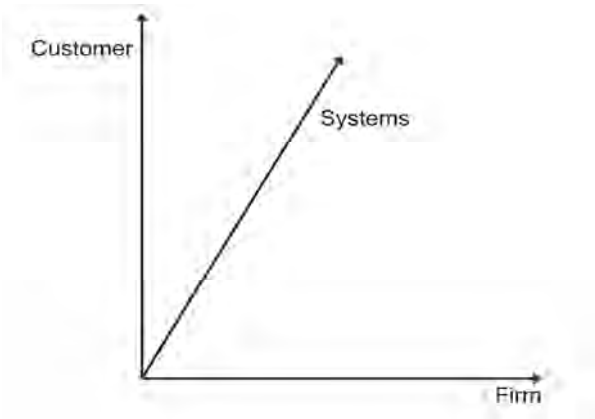


Figure 5.2 Hypothetical correlations between the dimensions of network performance

We expect that the performance from the customer and systems lenses are more strongly positively correlated than the firm and customer lenses (see Figure 5.2) however this remains to be explicitly studied and proven. Related to this is that scholars should find agreement on the common measures for key performance concepts. As discussed at section 5.3 managerial contribution, future research combining insights from performance evaluation in practice and from theory, can give rise to a network performance scorecard for both lead, network administrative organizations and also for network partners. Similar to Kaplan and Norton's balanced scorecard (1996), the network performance scorecard or would take into account multiple lenses simulataneously and serve as a strategic management system for network participation and administration.

Explaining Network Performance

Moreover, the information-based view on network performance needs further research. Through more extensive and complex laboratory experiments, variations in network information architecture can be studied over a longer period of time for its impact of network performance. Comparative case studies can replicate the effects of the market and professions type logics on network performance but also studies on the other types of institutional logics namely state, religion, family and the corporation are needed. The presented framework is seen as preliminary, we encourage researchers to study and potentially complete the categories in the framework. This main objective should be to develop a framework with categories that are mutually exclusive and collectively exhaustive in terms of the characteristics of interorganizational networks. Relations that require further support are for instance, the moderating influences of network contextual characteristics on the relation between network structural and network processes and network performance.

5.6 Concluding Remarks

The accumulation of knowledge in the area of network performance has been relatively slow. Research endeavours have been scarce and fragmented across disciplines, fields and across time. While network performance research presents scholars with several challenges it is also highly relevant to study from both an academic and practical perspective. We used the extant literature on business network performance as a starting point for its conceptualization and explanation. If future research builds on the findings of this dissertation we can get traction into understanding network performance.

To conclude, we hope this work encourages researchers to push the boundaries of knowledge and to continue revealing the performance of interorganizational networks.

Appendix

A. Interview protocols

Underneath are the introduction and questions of the semi-structured interviews (translated from Dutch) for the Route Mobiel network: road assistance companies, emergency call center and Route Mobiel. Not all questions for the emergency call center and Route Mobiel are asked to each informant, this depended on the job function (e.g. manager operations, commercial staff etc.) The other call centers and labels were asked similar questions to find out if there are differences in the way they operate and perform compared to the Route Mobiel network.

INTRODUCTION

The interviewer self-introduces and explains the purpose of the interview (i.e. Erasmus University Rotterdam is interested how the industry of road assistance works), interviewer thanks the informant for cooperation, summarizes topic of the questions, assures confidentiality of the information and asks for permission to record the interview.

Road assistance companies

1. What is your job function? What is the size of your company, in which area does it operate?
2. What are most important developments in the roadside assistance industry of the past years?
3. Why do you think end customers stay with Route Mobiel for road assistance?
4. How does the road assistance service provision take place in your company? How are service calls received? How is the message passed on to road assistance professionals?
5. Do you know which label is behind the service call? What information do you receive from the emergency call center? Does this differ across emergency call centers? Does the expertise of call center agents differ across these?
6. Do you always contact the customer? What information does your company share with the emergency call center and when? Does information sharing differ per call center?
7. To what extent is ICT used for sharing information with the emergency call centers? Have there been any changes in that over the past five years? What

information system do you use for service calls? What tracking system? Has this improved business processes of your firm?

8. Describe the ideal situation for providing road assistance, that realizes the highest level of customer satisfaction? What are the main factors that contribute to customer satisfaction?
9. What more information would you need from other firms in the network to realize the ideal situation?
10. How do you evaluate the ways of working of Route Mobiel and its emergency call center when servicing the end customer (ranging from very bad to very good), why do you think this? Do you think other labels perform better or worse?
11. Why do you work with these labels and emergency call centers? How do you select them and why do you continue working with these? Every three or five years does your firm register for the tenders of every emergency call center?
12. Are there any price reduction agreements with the emergency call centers? What are these? Are there any profit sharing models?
13. Did your firm have to invest in information systems in order to continue to work with certain firms? Does this differ across emergency call centers or labels?
14. How can the 30 minute onsite guarantee be realized with service calls?
15. How well is the company doing compared to the competition? What are the key performance indicators the company steers on?
16. Could this be achieved without Route Mobiel? Does the company attain its goals for profit by working for Route Mobiel? And for others? Which call centers is most important to you and why?
17. How well can your business handle a large amount of service calls? Are there any agreements between you fellow road assistance companies to call on each other during very busy periods?
18. How well can the emergency call center of Route Mobiel handle a large amount of service calls? Does this differs across emergency call centers?
19. What happens if one of your own vehicles gets into a breakdown situation or gets stuck in traffic? Does it happen often and how is it dealt with?
20. What happens if there is a disruption with the emergency call center? How does the call center deal with this? Does this differ across emergency call centers?
21. What points of improvements would you like to suggest to Route Mobiel?

Emergency call center

Introduction and Questions 1 and 3 are the same as above

4. How does the road assistance service provision take place in your company? How are service calls received?
5. What information is asked from the customer?
6. How do call center agents uncover the nature of the needed roadside assistance?
7. How are call center agents recruited and how are they trained?
8. Does the expertise of call center agents differ across emergency call centers?
9. How are service calls passed onto the road assistance companies? Does it always work the same way? Do road assistance companies know which label is behind the service call?
10. What other communication is there with other firms and the end customer when providing road assistance? What information is received and shared with other companies and the end customer?
11. To what extent is ICT used for sharing information with the emergency call centers? Have there been any changes in that over the past five years? What information system do you use for service calls? What tracking system? Has this improved business processes of your firm?
12. Is end customer satisfaction measured?
13. Describe the ideal situation for providing road assistance, that realizes the highest level of customer satisfaction? What are the main factors that contribute to customer satisfaction?
14. What more information would you need from other firms in the network or the end customer to realize the ideal situation?
15. How do you evaluate the ways of working of Route Mobiel and your company when servicing the end customer (ranging from very bad to very good), why do you think this? Do you think other labels perform better or worse?
16. How are road assistance companies selected, what is the purchasing policy? What requirements, service levels agreements do you ask from the roadside assistance Does this differs across the emergency call centers?
17. Is the performance of road assistance companies being monitored? Can they lose their contract before the end of the period, if so what happens then? Does this differ across the emergency call centers? Can all road assistance companies register for tender every three or five years?
18. Are there any price reduction agreements with road assistance companies? What are these? Are there any profit sharing models?
19. Does the call center demand road assistance companies to make investments in information systems in order to work with them? Does this differ across emergency call centers or labels?

20. How can the 30 minute onsite guarantee be realized with service calls?
21. How well is the company doing compared to the competition? What are the key performance indicators the company steers on?
22. Could this be achieved without Route Mobiel? Does the company attain its goals for profit by working for Route Mobiel? And for other clients?
23. Are the telephone lines and the system prepared for a large amount of service calls? What happens when there is an abundance of calls such as with last winter, are there procedures for this? Does this differ across emergency call centers?
24. What happens when roadside assistance companies have to deal with a large amount of service calls and waiting times increase? Have agreements been made that they have to call upon a fellow road assistance company during busy periods or do they arrange this themselves?
25. What happens if there is a technical disruption with the telephone lines? Does this happen often and how is it dealt with ? How does the communication with other companies and the end customer then take place?
26. How good are the procedures for disruptions for all firms in the network? Is this different for competitors, do they have different procedures?
27. What points of improvements would you like to suggest to Route Mobiel?

Route Mobiel

Introduction and Questions 1 and 3 are the same as above

1) How are service calls received by the emergency call center? What information is received? How is the message passed on to the road assistance professionals?
2) Do road assistance professionals always contact the end customer after receiving the service call? Is this a requirement by Route Mobiel?
3) When and how does Route Mobiel receive information about handled service calls? Is the customer database linked with the emergency call center (and other firms in the network)?
4) What further information does Route Mobiel share with and receive from other firms for road assistance service provision?
5) What information does Route Mobiel shares with and receives from customers?
6) To what extent is ICT used for sharing information with firms in the network? Have there been any changes in that over the past five years? If so, has this improved the business processes of your firm?
7) What are the main factors that contribute to customer satisfaction?
8) What further information would Route Mobiel like to have from other firms in the network or the customer to optimize customer satisfaction?
9) How do you evaluate the ways of working of Route Mobiel when servicing the end customer (ranging from very bad to very good), why do you think this? Do you think other labels perform better or worse?

10) When and how does Route Mobiel communicate with the customer during and after the provision of road assistance services? How are the customer surveys conducted? Is customer satisfaction also being measured by competitors?
11) What happens to customer complaints about the service? Are road assistance companies called to account by Route Mobile or the emergency call center?
12) How are road assistance companies selected to work for Route Mobiel? How are they examined? Are there any differences with how other call centers select? If so what are the differences in demands?
13) Did Route Mobiel require any investments from road assistance companies in order to continue working for Route Mobiel?
14) Does Route Mobiel have any influence on the selection process of road assistance companies by the emergency call center? How about with elimination after underperforming?
15) Can road assistance companies working for Route Mobiel lose their contract when they underperform? How is this monitored and by whom?
16) Are road assistance companies rewarded for good or exceptional performance?
17) Does Route have direct contact with the road assistance companies within and outside of the Netherlands? Are there regular meetings with them? Does this differ for competitors?
18) Does Route Mobiel communicate and negotiate directly with car rental, garage and taxi companies? Have there been any very costly service calls that Route Mobiel found out about later?
19) Who is billing whom? Is the emergency call center paid for full handling of the process and does the call center in turn pay the road assistance companies?
20) Does Route Mobiel have insight into the margins and prices that emergency call center pays the road assistance companies? Does Route Mobiel have a detailed understanding of the costs? How does Route Mobiel manage these costs?
21) Why did Route Mobiel select this emergency call center? Are call center agents specially trained and used for Route Mobiel?
22) Are the large differences in the ways of working across the emergency call centers?
23) What happens if the emergency call center does not meet with service level agreements? Is there a bonus-malus system?
24) Does Route Mobiel organize its network in a different way than competitors? Does Route Mobiel set different requirements to road assistance companies than competitors? Does Route Mobiel have more insight into its network and more contact with the road assistance companies than other labels?
25) What are the key performance indicators that Route Mobiel steers on? What are the most important indicators to optimize for the network?
26) How does Route Mobiel distinguish itself from other labels?
27) Why is Route Mobiel able to service the customer faster than the Anwb?
28) Does the Route Mobiel service cover the whole country of the Netherlands?
29) How well can Route Mobiel and its emergency call center handle a large amount of service calls such as during last winter?
30) What happens when road assistance companies are too busy, are there any agreements to call upon each other during hectic periods, what are the procedures here?
31) What happens if there is a disruption at the emergency call center, how do they deal with this?

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Summary

In the last thirty years, global developments including advancements in ICT and process and product modularization have made the network form of organization more widespread than ever before. In many industries large vertically integrated organizations have been supplanted by flexible networks of independent organizations. In other industries and sectors, individual organizations continue to operate through the traditional organizational form of a business network. The proliferation of business networks presses the need to move theoretical development on processes and outcomes forward, beyond actor and dyadic level to the whole network level of analysis. Network performance studies however, have been scattered both across time and across management disciplines, and offer diverse concepts, measures and drivers, which slows down the theoretical build up. A related problem is that the conceptual issue of what constitutes performance on network level, has been left unaddressed. The main purpose of this dissertation is therefore to conceptualize and explain the performance of interorganizational networks. This is done by executing three studies: conceptualization research (Chapter 2), laboratory experiments (Chapter 3) and a field case study (Chapter 4). Chapter 2 organizes and integrates the contribution of the diverse extant network performance literature, this results in a comprehensive conceptualization through three different lenses (firm, customer and systems). Further analyses lead to the categorization of factors driving network performance including a concept termed network information architecture that is an important driver of network performance via network processes and network structural characteristics. Chapter 3 explores the indirect effects of network information architecture on network performance through the customer lens with controlled laboratory experiments. Chapter 4 validates the three lenses by applying these to a business network in the field. In this case study market type and professions type of institutional logics are found to indirectly impact the network information architecture and explain network performance through the behavior of the organizations in the network. Step by step an integrated framework is built in this dissertation that represents the information-based view on network performance and its theoretical mechanisms. This dissertation pushes the boundaries of knowledge on network performance, increases the understanding and ability of practitioners to manage their networks and sets the agenda for future network performance research.

Dutch Summary (Nederlandstalige Samenvatting)

In de afgelopen dertig jaar hebben wereldwijde ontwikkelingen waaronder geavanceerde ICT en de modularisatie van producten en processen ervoor gezorgd dat de netwerk vorm van organiseren meer dan ooit tevoren een wijdverspreid fenomeen is geworden. In veel industrieën hebben grote verticaal geïntegreerde organisaties plaats gemaakt voor flexibele netwerken van individuele organisaties. In andere industrieën en sectoren opereren organisaties nog altijd via netwerken als zijnde de traditionele organisatievorm. De snelle toename van bedrijfsnetwerken creëert de dringende behoefte om de theorie ontwikkeling omtrent processen en uitkomsten vooruit te brengen, voorbij het analyse niveau van actor en dyade naar het hele netwerk. Studies naar netwerk prestaties doen zich echter verspreid in de tijd voor, zijn door verschillende management disciplines uitgevoerd en richten zich op diverse concepten, maatstaven en factoren, hetgeen de opbouw van theoretische kennis vertraagt. Een aanverwant probleem is dat het conceptuele vraagstuk van wat netwerk prestatie omvat nog niet aangepakt is. Derhalve is het hoofddoel van dit proefschrift om de prestatie van interorganisationele netwerken te conceptualiseren en te verklaren. Dit wordt gedaan middels de uitvoering van drie studies: conceptualisatie onderzoek (Hoofdstuk 2), laboratorium experimenten (Hoofdstuk 3) en een veldstudie (Hoofdstuk 4). Hoofdstuk 2 ordent en integreert de bijdragen van de bestaande, diverse netwerk prestatie literatuur hetgeen resulteert in een algehele conceptualisatie via drie lenzen (bedrijf, klant en systeem). Verdere analyses leiden tot de ordening van factoren die netwerk prestatie beïnvloeden waaronder een concept geduid netwerk informatie architectuur wat een belangrijke factor is van netwerk prestatie via netwerk processen en netwerk structurele kenmerken. Hoofdstuk 3 verkent de indirecte effecten van netwerk informatie architectuur op netwerk prestatie geëvalueerd door de klant lens middels experimenten in een gecontroleerde laboratorium omgeving. Hoofdstuk 4 valideert de lenzen door deze toe te passen op een bedrijfsnetwerk in de praktijk. In deze casus blijken markt- en beroepstypen institutionele logica indirect de netwerk informatie architectuur te beïnvloeden en de netwerk prestatie te verklaren via het gedrag van de organisaties binnen het netwerk. Deze hoofdstukken bouwen stap voor stap een geïntegreerd model dat het op informatie-gebaseerde perspectief en de prestatie van bedrijfsnetwerken weergeeft en zijn theoretische mechanismen. Dit proefschrift verlegt de grenzen van kennis over netwerk prestatie, vergroot het begrip en het vermogen van het werkveld van om zijn netwerken te besturen en bepaalt de koers voor toekomstig onderzoek naar netwerk prestatie.

About the Author

In the cool summer of 1982 Sarita Koendjbiharie was born in The Hague, Netherlands. Before coming to university she went to the Dalton Scholengemeenschap Den Haag where she did Atheneum and enjoyed her economics courses and languages in particular. Then it was time venture out to Rotterdam where she studied Business Administration and Marketing Management at the Faculteit der Bedrijfskunde at the Erasmus University. She thought she was going to be a manager for sure. But that path was changed when she finished her master thesis on online research and was recommended to apply for a PhD position by her co-reader, one prof. Peter Vervest. Goodbye industry.

Before joining the Rotterdam School of Management as a PhD candidate, she did hold several positions at companies in marketing and editing, however university was always on the horizon. After quite a switch to Information Management at the then Department of Decision and Information Sciences, Sarita became increasingly intrigued by the research area of interorganizational networks. She visited and presented at international conferences including Sunbelt, WIN Workshop, EGOS and Academy of Management Annual Meeting. During her PhD she fulfilled many other roles such as master thesis coach/co-reader, teaching assistant, course coordinator and workshop instructor with the Business Networking Game (over a 100 sessions with managers and students, which is the official world record). One of the best roles (in her book) would be serving as a PhD representative in the Daily Board of the Department for about 4 years. She did her best to create one well-performing, dense network of PhD students with as few bridging positions as possible.

During the last two years Sarita was fortunate to be part of a scientific collaboration between a large insurer and the university as well. Management and execution of consultancy projects, master thesis projects and case competitions were among her responsibilities, which led her along a path that went from the mainport of knowledge to the bastion of liberty.

Since February 2014, Sarita holds a position as lecturer and academic internship supervisor at the Faculty of the Humanities at Leiden University. There she is enjoying designing and teaching courses in the International Studies curriculum and developing the (inter)national network for the program. Coming from a B-school background she brings her ambition, knowledge and network to an equally ambitious bachelor program founded in 2012 followed by driven students. She likes it there. At the Humanities which house the *shepards of the world's cultural heritage*, she will brush up on her languages and continue to connect academia and practice in her own way.

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THE INFORMATION-BASED VIEW ON BUSINESS NETWORK PERFORMANCE
REVEALING THE PERFORMANCE OF INTERORGANIZATIONAL NETWORKS

Global developments including advancements in ICT and product and process modularization have led to the transformation of large vertically integrated organizations into flexible business networks in many industries. In yet other industries and sectors, networks of individual organizations have continued to exist as traditional organizational forms. The proliferation of business networks presses the need to move theoretical development on processes and outcomes forward, beyond actor and dyadic level to the whole network level of analysis. Network performance studies however, have been scattered both across time and across management disciplines, and offer diverse concepts, measures and drivers, which slows down the theoretical build up. A related problem is that the conceptual issue of what constitutes performance on network level, has been left unaddressed.

The main purpose of this dissertation is therefore to conceptualize and explain the performance of interorganizational networks. This is done by executing three studies: conceptualization research, laboratory experiments and a field case study. These studies integrate the contributions from the diverse extant literature and conceptualize and validate network performance through three different lenses. The studies also identify a new concept termed network information architecture, and institutional logics as main drivers of network performance via network processes and network structural characteristics. The findings in this dissertation are drawn together in an integrated framework which represents the information-based view on network performance. This contribution pushes the boundaries of knowledge on network performance, increases the understanding and ability of practitioners to manage their networks and sets the agenda for future network performance research.

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Design & layout: B&T Ontwerp en advies (www.b-en-t.nl) Print: Haveka (www.haveka.nl)